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LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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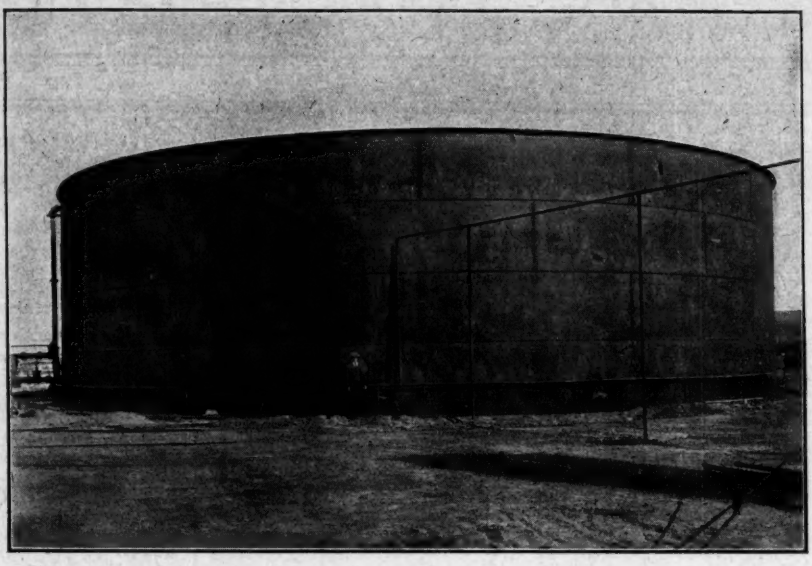

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EDITORIAL NOTES.

Large Ratepayers and the New Electricity Bill.

THE new Electricity Bill has received second reading in the House of Lords, but not without considerable opposition. This Bill is the one that is intended to confer financial powers upon the Joint Electricity Authorities which are being created from a much-divided electricity industry for the generation of electricity and its transmission in bulk to authorized distributors. These Joint Authorities are to annex, develop, construct, and operate electricity generating works in their mapped-out areas. Many electricity undertakings are opposed to this; and there is a deep cleavage in electrical technical opinion as to the soundness and beneficial issues of the schemes. The more they are probed, the less they are liked and approved. But at the moment the Joint Authorities are impotent because they have no financial powers. Ever since the primary Act was passed, there has been influential opposition to the plans for financing the schemes. The financial clauses had to be excised from the original Bill; and since then supplementary measures to rectify this have crept out into the light, and on seeing the magnitude of resistance to progress, have promptly slunk back into the recesses of parliamentary oblivion. But now a further attempt is being made to get the financial powers; and industrial and financial people are once more up in arms. Those who father the measure describe it as non-controversial; and the misdescription has already been thrust violently down their throats. Of course, the National Gas Council have had to consider the measure as it will affect the gas industry; and the Central Executive Board of that body have approved the steps which are proposed for the protection of gas undertakings. The gas industry cannot take exception to any legitimate development in the electricity industry that will benefit it; but it has a right to object to plans which will unfairly affect its interests, and which in its opinion are wrongly conceived, and introduce unsound principles. These Joint Electricity Authorities are amorphous bodies, whose operations will extend over large areas, variegated in respect of population, industries, and demand. There is at present only the vaguest notion as to what they are going to do, what the costs of their operations will be, and what will be the financial issues. Whether they will develop a greater economy than proceeding on the present lines is a matter of unqualified surmise, and therefore pure speculation.

Such Joint Authorities ought to raise direct any capital they require, and be wholly responsible for it. We do not know what lines the National Gas Council are going to pursue in endeavouring to protect the interests of the gas industry; but there are certainly points to which they and all gas undertakings, as large ratepayers, should take exception. Ratepayers everywhere—particularly large ones like gas undertakings—should take the strongest possible exception to local authorities becoming lenders of money as well as borrowers, and especially to lending to bodies over which they will have no effective control; their representation (if they have any) only forming part of the whole. The very fact that this lending is proposed suggests that those who are responsible for the contents and drafting of the Bill rather suspect the Joint Authorities will not be altogether well regarded by the investing public. Briefly, in addition to the Bill authorizing the Joint Authorities to raise money direct, it proposes to empower local authorities within the area of a Joint Authority to lend to it money for the raising of which the local authorities possess authorization. It also proposes that local authorities may guarantee, or join in guaranteeing, the payment of interest on any moneys borrowed by a Joint Authority, or on any securities issued by that authority; and a still wider power is to give financial assistance "in any other form" to the Joint Authority. It is true the consent of the Ministry of Health is to be obtained; but we do not place much value upon this, seeing that the Ministry of Health are not likely to run counter to any other Government Department in such a matter. We do not like this lending, guaranteeing, or rendering financial assistance "in any other form." It is not right. It is not in the interests of sound municipal finance. Ratepayers of all classes should set their faces sternly against their local authorities becoming money lenders, or pledging the credit of a borough or district for the benefit of a body that has a complete separate existence, and whose operations are controlled by a representation mixed and subject to change in respect of men and therefore policy. A Joint Authority may be of excellent constitution at the initial stage; it may not be so after a few years. No one can tell, with the alterations in government that time brings about. Another matter which may require careful looking into is that the Electricity Commissioners may approve of any form of tariff for the supply of electricity. It is time that, in the adoption of tariffs for electricity, there was prohibition against adopting as the basis of charge something altogether dissociated from the elements of the service rendered. Rateable value and floor area have nothing to do with electrical provision and service; and yet the bi-part tariff as at present applied is based on one or other of these, or something equally as ridiculous. There are points that the gas industry have a right to look into—not as competitors, but as large ratepayers. What electricity companies do, cannot be objected to by the gas industry; but what local authorities do, is very much the concern of considerable ratepayers.

The Fuel Problem.

ONE of the features of modern technological progress is the direction of thought and discussion to the more economical utilization of fuel, by the realization of higher efficiencies. It is one of the problems in work in which, generally speaking, this country is backward, largely through an adhesion to more or less traditional methods, and a former light-hearted regard for fuel conservation, owing to the past cheapness of coal and the liberties of the consumer in respect of the manner of its use. Times have changed. Heat, power, labour, material, and everything else is dearer; and so manufacturers have perforce become more concerned in economies which shall help to palliate expenses that are unavoidably higher. The need is becoming to be looked upon also as a duty; and this has been hastened by the propaganda work that has been done—in some cases voluntarily, in others with a certain amount of self-interest. There must be acknowledgment of the lead that Prof. Bone gave in this matter; likewise of the industry in research at, and enlightenment in many matters that have come from, H.M. Fuel Research Station, under the direction of Sir George Beilby and a competent, diligent staff. There is also claim to some credit for the Gas Investigation Committee of the Institution of Gas Engineers and the Leeds University; and the convincing work of Sir Dugald Clerk and Profs. Smithells and Cobb should be acknowledged. Technical and industrial bodies have taken up the matter from their respective points of view, and as touching their immediate interests. An atmosphere of higher efficiency in fuel use has undoubtedly been successfully created; and this is the first step to a better state of things through inves-

tigation and practical application. And in respect of practical application, exploration and invention are active; but here there is just some danger of people, through enthusiasm, prepossession, prejudice, or self-interest, getting somewhat off the track. It is important in the interests of the country that this should be avoided; and this can best be done by the Government continuing in being an independent and unbiassed body such as the Fuel Research Board and their experimental station and staff, to investigate reliably those things that promise advantage to the industries of the country. This is undeniably of national importance. Had matters been more advanced in respect of Government investigation into fuel problems when the electricity power committees were considering the question of reorganizing the generation of electricity for the provision of power, the subject might have had more extended survey, and something evolved which would have had a greater and more potent effect on the whole problem of heat and power production and the conservation of fuel. As it is, there is no unanimity respecting the lines along which the Government have been moving: and technical, financial, and manufacturing opinion is all sharply divided as to the fundamental economic soundness of the schemes, and that from every point of view.

However, the fuel problem was the subject of a lecture by Dr. C. H. Lander, who assists Sir George Beilby in the work of the Fuel Research Board, at a meeting last week of the South Wales Branch of the Institution of Mechanical Engineers. It was one of those lectures that refreshes memory; and it brought, in clearly defined manner, before those who heard, and will bring to those who read, some of the work that is proceeding in the effort to solve problems and to progress, with an indication of the advance so far effected. It illustrates, too, the mistake that is made in too narrowly confining the attention to any single phase of the vast problem. It is a problem made up of many parts. Coal utilization goes on everywhere; and the purposes of its use are diverse. But in the survey, the work of the gas industry does not stand at all badly; and in coal utilization in the interests of the country, it is unquestionably taking a good lead. Gas has, through its enormous use, a proved indispensability; so has coke; so have the other secondary products of coal carbonization. The enormous consumption of gas shows that requirement and beneficial use cannot be directed alone on the lines of thermal efficiency and economy; and perhaps an even more striking example—through extraordinarily bad thermal efficiency—is the development of the electricity industry. But taken either separately or together, it is the duty of these industries to work to achieve maximum fuel economy and efficiency in their respective spheres. Speaking generally, however, of fuel utilization, Dr. Lander, early in his lecture, issues something that is tantamount to a warning. It is that the thermal efficiency of the process of fuel utilization depends to a great extent upon the form of fuel; and it becomes necessary to judge in each case whether it is economically sound to use a large amount of heat from cheap fuel (which cannot be utilized with high efficiency), or, on the other hand, to use a smaller amount of heat from a higher grade fuel which can be utilized with high efficiency. This is well exemplified in gas-works practice. In this it is impossible to create and set-up standards of efficiency which can be universally applied or accepted, without reference to the character of the coal. For example, with the Welsh coal that is used for gas making, the expenditure of heat in utilizing it may be as great as, perhaps even more than, in the case of (say) a Durham or Yorkshire high-grade coal; but the thermal efficiency or productive results will be distinctly inferior. Yet in view of transport costs, it is economically sound to use the coal which gives the inferior results—thermal and productive.

Dr. Lander reminds us that Sir George Beilby has given us the useful term "availability of heat" in connection with this aspect of the subject—a fuel of "high availability" for a particular process being one the heat of which can be used with comparatively high efficiency. All processes of fuel production, he goes on to say, have for their object the increase of the availability of heat; and all processes for the raising of heat availability are accompanied by losses. The losses may be of heat or money or both. These are radical considerations which coal carbonizers particularly should have well in mind in considering their processes—especially new processes. In the conversion of coal with gas as the primary product, and the same with coke, one has to consider whether, with the most available coal, the increase of "heat availability" in the product will show with the new process a balance of gain in comparison with any (if any) increase of heat loss or of capital and other cost. Justification for adoption can only be found in the superiority of gain over loss.

In this connection, the lecturer gave as the prices commanded for a potential therm in three forms of fuel the following figures: Coal, 1d. to 2d.; gas, 10d. to 18d.; motor spirit, 20d. to 25d. The gas figures are rather applicable to this part of the country. There are places nearer the coal-fields where gas therms are available at a lower rate than 10d. Probably out of consideration for the feelings of the electricity industry, or because for practical purposes the electric therm is outside the bounds of reasonable consideration, Dr. Lander did not quote the cost of an electric therm. To produce a therm, 29 units would be required, which at 2d. per unit would be 58d. This shows that the efficiency of use would at this price have to be about six times better than that of a gas therm at 10d.; or if the electricity was 1d. per unit and gas still 10d. per therm, the efficiency of electrical use would have to be, to reach cost equality, three times better. This it is not. As between coal and gas (which is more important), efficiency of gas use reduces the difference of cost per therm considerably and variably for different purposes, to say nothing of labour saving, heat availability, cleanliness, fuel and therefore heat saving by use only as and when required, by the wiping out of stand-by losses such as occur in maintaining coal fires between the times when use is actually needed.

In the succeeding section of the lecture, Dr. Lander indicated some of the work upon which the gas industry is engaged in raising the thermal efficiency of its fundamental process. The Gas Regulation Act has considerably advanced opportunity in this respect; and for this the gas industry and the country generally have to thank the Board of Fuel Research for their original work and recommendations in this connection. The proposals the Board made, and Parliament accepted, are far-reaching—Dr. Lander thinks particularly so in respect of the charges to the consumer being based upon thermal value instead of volume. This is highly important; but in regard to thermal efficiency and economy, what this change made possible is fraught with tremendous potentiality. The ability to declare the calorific power per cubic foot of gas that a gas undertaking can most economically supply is something the value of which cannot be over-assessed in respect of economic development, in view of the fact that in usual practice hitherto only some 20 to 25 p.ct. of the heat value of the original coal is obtained in the form of gas—though this does not represent the thermal efficiency of the process, when the heating value of the coke and tar is taken into account. The lecturer showed what the industry has actually accomplished in increasing the proportion of heat available in gas through steaming in vertical retorts, in the investigation of which system valuable work has been carried out at the Fuel Research Station. By the process, not only more therms, but more tar and ammonia are obtained, with a decreased expenditure of heat, owing to the steam extracting heat from the spent coke in the lower part of the retort. It is noticed that the Board are continuing their steaming investigations using types of coal other than those regarding which we have already had the data derived from the researches at the Research Station.

The lecturer carried his audience along to low-temperature carbonization. The advocates of the system appear to think that the practitioners in high-temperature carbonization are violently opposed to the idea of a smokeless fuel such as they propose, and an increased yield of oils per ton of coal, such as can be obtained by the application of low temperatures. This is quite a mistake. The practitioners of high-temperature carbonization would immediately turn from their practices to those of the low-temperature order were they satisfied that their objects could be better served with commercial success. This is just where Dr. Lander's experience comes in usefully—an experience drawn from continuous investigation at the Fuel Research Station with a large number, and mixtures, of coals. Commercial practicability has yet to be proved. The costs of the process are high relative to total product; and the smokeless fuel has to enter into trading rivalry with the raw material from which it is produced. When claims are advanced by those concerned in low-temperature processes, and company promoters issue prospectuses which show a great wealth of

result from low-temperature operation, it will be well to ask how it is then that, with all the continuous work at the Fuel Research Station with a variety of coals, Dr. Lander presents as typical of the results obtained: 14 cwt. of coke; oils, 15 gallons; gas, 3000 c.ft.; liquor, 24 gallons; and sulphate of ammonia, 6 lbs. The staff of the Fuel Research Station are wholly disinterested; they are not concerned in any one system; and they are not company promoters. Their figures have no resemblance to those of the low-temperature people—other than perhaps in the matter of coke. This fact will be borne in mind.

The lecturer dealt with steam-raising, and the domestic utilization of fuel. But our comments have already carried us far; and so we leave these other matters, with the remark that the review of the fuel problem which Dr. Lander made could not have compassed so much within the limits of time had the treatment of the subject been in the hands of one who has not lived so intimately in it, and who has not such personal knowledge and interest as he possesses.

A Policy of Stupidity.

THE members of the engineering and shipbuilding trade unions are showing an overwhelming possession of crass stupidity. Through indolence, a want of intelligence, or an abject unwillingness to do the correct thing in the face of the bad counsel of extremists, a proportion of them have refrained from ballotting on the proposals which were submitted to them for their ratification or rejection by their representatives, who had been in negotiation with the employers. The result of a large proportion of abstentions from voting is that, so far as the voting went, majorities were given in favour of rejection; and in the case of the members of the Amalgamated Engineering Union, this meant a lock-out in accordance with the notices given by the employers, who were driven to this extremity by the challenge that had been issued as to their right to exercise managerial functions without consultation with, and endorsement by, the Union. The shipbuilding dispute is still in the balance; but as things stand at the time of writing, there seems little hope of averting a strike. In this case, the question is as to the cuts of wages in respect of the additional 26s. 6d. that is being paid to the men. The masters suggested its removal in two stages; but this was repudiated. Then came the proposal that 16s. 6d. should be taken off in two cuts, and the 10s. remain in abeyance for further consideration. The object is to get the shipbuilding industry once more on to an economic basis, and so enable the employers to make conditions more attractive, in order that the idle or only partially employed yards and stocks may again become busy. As it is, Continental shipyards are being kept active with work at prices with which our own yards cannot compete. Thus it is that the Union members themselves are very largely the creators of the extensive unemployment in their ranks; and the country goes on paying.

Another curious phase of the position is that, while in the central counsels of trade unionism agreements are effected for the consideration of the members, the district representatives appear to exercise a pernicious influence among the men; this being due apparently to a preponderating number of extremists among them. To this state of things is attributable the fact that a majority of those who take part in the ballots vote for rejection; while the more sober-minded and (up to a point) reasonable men refrain from voting. Their duty should be to vote in the manner that their conscience dictates as being right; and the result, we believe, would be a somewhat uncomfortable one for the ultraists. As it is, abstention assists these men in their nefarious work, and paves the way to all the misery of a widespread stoppage of employment, which the country and its workers could never less afford than now. Apart from the conditions of industry, in the labour world available funds are low through trade disturbances and unemployment. The Amalgamated Engineering Union last week voted £200,000 from the funds to send to the branches for distribution among the men locked out. That sum will not go far among so many. The Executive know perfectly well they are not in a position financially to make a stand for any length of time of an order that will satisfy the men; and they are equally aware that the dispute is over a question in regard to which the employers are morally in the right. From the labour side there have been appeals to the Government to intervene and to hold an inquiry into the disputes. The Government, however, are taking a clear and correct attitude in the matter. They do not consider the time opportune. To set up a Court of Inquiry now would be to prejudge the decisions of members of trade unions who are ballotting. The Government apparently want to see an unfettered ballot of the men; and, if necessary, they would use their influence to bring the parties together. If then there was failure, a Court of Inquiry would be possible. As the Government say, in all probability a Court of Inquiry now would only prolong the dispute. We are rather inclined to think, looking over the industrial events of the past twelve months, that it would do so. Government interference has not been much good in these matters. Very often "success" has been achieved by Government intervention—when one of the parties realizes that they have come to the end of their tether.

Routine Gas Analyses.

THE Gas Regulation Act will necessitate a larger amount of chemical control on gas-works than hitherto; and the responsible officials will welcome any and every method that will lighten their work in obtaining sufficiently indicative results. There is analytical work in which very exact results are required; and the more accurate they are, the greater the value. But this is not the case in ordinary routine testing of gas, in which the results are adequate if approximately accurate—so as to ascertain, for example, whether standards of composition are being reasonably adhered to. For this purpose, elaborate forms of apparatus are not needed, if simple types are available. Prof. R. V. Wheeler, of the Department of Fuel Technology at the Sheffield University, in an article printed in other columns this week, describes a simplified adaptation of the Hempel apparatus, in the use of which he has eliminated two sources of error, which elimination makes the apparatus generally handier, and capable of use by anyone sufficiently intelligent to be taught its purpose. Those with experience of the Hempel apparatus will agree with Prof. Wheeler that the chief opportunity for error occurs when one absorption vessel is detached from the burette in order to substitute another. The prevention of a bubble of air then is almost an impossible matter. There may also be serious error through the absence of facilities for washing the gases after their treatment with the various absorbents—for instance, after treatment with ammoniacal cuprous chloride for the removal of carbon monoxide. Prof. Wheeler managed to eliminate these two sources of error, and to render the apparatus generally handier in use, by connecting all the absorption vessels and the explosion vessel to the measuring burette by a system of three-way taps, and by the provision of washing facilities. In some respect, there is in this a resemblance to the Orsat apparatus. In producer-gas analysis results have been obtained by a foreman comparable with those given by a check analysis carried out over mercury in a research apparatus. There was also a saving of time. By a suitable choice of absorbents, the apparatus has been adapted for the analysis of coal gas and coke-oven gas; and for these purposes also, the results are sufficiently accurate for routine work. The methods of absorption and explosion are explained in the article, together with an account of the method of manipulation. Regarding the saving of time, Prof. Wheeler informs us that each analysis of coal gas takes about half an hour. But further time can be saved by passing several different samples through the apparatus simultaneously, each at a different stage of the analysis. Four analyses so conducted take rather more than an hour. Chemists on gas-works and bye-product coke-oven plants will be particularly interested in Prof. Wheeler's description of this adaptation of the well-known apparatus, which he originally devised because the number of analyses he had to make on the producer-gas plant "imposed a task which "became irksome to one who is of a naturally lazy dis-"position." Prof. Wheeler himself says this. We believe in the irksomeness; with all deference, we decline to believe, from some knowledge of his extensive work, in the "lazy disposition."

"The Gas Salesman."

No. 3 of "The Gas Salesman" will be published in next week's issue of the "JOURNAL." Any communications intended for it should be posted as early as possible—anyway so as to reach this office by Monday morning. Those undertakings that have not registered permanent orders, and desire extra copies for circulation among their sales staffs, should send their orders at once to avoid disappointment.

Sulphate of Ammonia.

There is an extraordinary demand for sulphate of ammonia for home consumption; and gas undertakings are urged to do all they can to increase the output.

Gas Examiners' Appointments.

Regarding the appointment of gas examiners under the Gas Regulation Act—a matter which is interesting many prospective candidates—the Gas Referees are preparing a General Notification, a draft of which before general issue will be submitted to the National Gas Council for their comments. The question is in the hands of a Committee and the Managers to the Council.

Gas Coal Position.

Away North the gas-coal position remains unchanged. There is not much room for immediate variation in the conditions, seeing that so many of the collieries are booked-up well ahead. This particularly refers to Durham and Northumberland; and the same applies to Yorkshire in respect of the better or screened sorts. Here unscreened and second qualities require buyers. In Nottinghamshire there is a slackening-off of inquiries; and there as elsewhere buying continues in the open market, where supplies are obtainable at below contract rates. There is a disposition among some gas-works to have partial recourse to stocks for current working, which stocks represent fairly high prices per ton, and not of the quality and cleanliness now procurable. The hope of lower prices also affects policy in respect of stocks.

Railway Rates.

The National Gas Council and the representatives of bye-product coke-ovens are separately taking prominent part in the appeal for a further reduction of railway rates for coal and coke. The planks in the National Gas Council's programme in this respect are: (1) Abolition of the flat-rate increase of 4d. per ton. (2) Further reduction in the percentage increase. (3) Reduction of the 4s. maximum to 3s. at least. Both gas undertakings and coke-oven plant owners have strong claims to consideration in this regard; and especially the former, because so many of them are well-away from the coal-fields. Moreover, they create traffic for the railways. They buy coal, which has to be transported. Coke, tar, ammoniacal liquor, sulphate of ammonia, and other things which constitute their secondary products have all to be carried by some means from one place to another. We think there are signs that the railway managers are inclined to yield to the persistent pressure being brought to bear upon them.

At Sheffield.

The Yorkshire Junior Gas Association visited Sheffield last week, and were very hospitably received, on behalf of the Gas Company, by the General Manager (Mr. Ralph Halkett). There was something very appropriate about the reception of the visitors by Mr. Halkett, inasmuch as he is an erstwhile member of the Association, and has trodden the road to a place of high responsibility in the industry. The address with which he welcomed the visitors was short; but it was full of that which is good when addressing members of the profession still occupying junior positions. There was the advice born of experience; there was the encouragement from one who knows its value. The young man who desires to qualify for high position in the industry must be an individual of many parts, and must have a good knowledge of all sections of the work of the industry. It is one of the features of the junior organizations that Mr. Halkett applauds, that they do not confine themselves to any one branch, but embrace everything from engineering right to sales. He advises them not to overlook the rental and finance sides. The keeping of records in every department, and working to standards with ideals in advance of them, are as important to the general economy of a concern as chemical control is to manufacture. "The required knowledge can be acquired, but not without real work and diligence, and the application of all the intelligence and enthusiasm that we possess."

New Construction and Reorganization.

Apart from the reception of the Yorkshire Juniors, the Sheffield Gas Company's works and organization generally are in a position to-day which has great attraction for the budding gas engineer or manager of any department. The chemical works have been modernized and extended; a considerable Woodall-Duckham vertical retort plant is so far advanced that a few months hence it will be under heat; gas from a coke-oven plant is also utilized by the Company (Mr. Halkett made some cautionary remarks in this connection); and every department is now undergoing an overhauling with the view to modernizing and reorganizing. The pressure on the Company during the war unavoidably pushed matters very much in arrear; and there has been considerable work before and upon those responsible to bring things into correspondence with the requirements of to-day. But this condition is gradually emerging from the work in hand. The Sheffield Company have earned a high reputation for cheap gas; those who have charge of its operations to-day have no intention that it shall be anything in its equipment and general organization but of front rank.

Progress in the Gas Industry.

This is the subject of an article in "The Times Trade Supplement." Charts accompanying the article are highly interesting in the information they convey regarding the progress in certain respects of the three Metropolitan Gas Companies. The information starts at 1884—a year in which the possibilities of electric light began to be appreciated. In the forty years, the volume of gas sold per annum by the three undertakings has increased from 22,000 million cubic feet to nearly 50,000 million cubic feet; while the individual private consumers approach 1½ millions, as compared with 300,000 in the early nineties. Thirty years ago, the consumers per mile of main numbered about 100; to-day, they exceed 300. In 1884, the net gas yield per ton of coal approximated 10,200 c.ft., with a net coke yield of 9¼ cwt. In 1921 the gas yield had been augmented to 12,360 c.ft.—of course, straight coal gas—while the net coke made for sale was 10¼ cwt. Another interesting point is that the amount of fuel required to effect the carbonization of a unit quantity of coal has systematically been reduced. Of the total coke made the percentage used as fuel was, in 1891, 26 p.ct.; 1900, 23 p.ct.; 1910, 22 p.ct.; 1915, 21 p.ct.; 1917, 18 p.ct.; 1920, 16 p.ct.; 1921, 18·4 p.ct. Last year was one of abnormal circumstances; but, apart from it, there has been consistent progress in economy in the percentage of coke used as fuel by the three Metropolitan Gas Companies.

Gas for Newspaper Work.

Some five years ago, stated Mr. P. J. Lafore, in the course of a paper read before the New England Association of Gas Engineers, the first newspaper in Boston changed over its twin 8-ton auto-plating pots from coal to gas; and this installation proved so successful that other papers quickly followed suit. There are, in fact, at the present time only two dailies which still use coal under their pots. Gas had already been used with considerable success for linotype machines and generating steam for the matrix pots; and now practically all this work is done by gas. Various types of burners have been used, both pressure air and pressure gas; the result in most cases being very good. It was found, however, that the character or shape of the flame had an important bearing on the working. A short, hard flame did not heat the pot uniformly, and was liable to crack the pot; whereas a softer, longer flame which spread out, under and round the pot, gave much better results, and had less effect upon the pot. There was some question at first as to whether the pots would stand gas; but there has been very little trouble from this source. Where the proper type of burner has been installed, there has not been a cracked pot in any of the auto-plating machines in Boston. On the other hand, several pots have been broken where a short, hard flame was used. Among the advantages of gas are increased output and speed, both of which are of the utmost importance in newspaper plants. The temperature of the room is lower; and the plant is cleaner.

Scottish Junior Gas Association (Western District).—We regret that it has been necessary to hold over the report of the proceedings at the last meeting of this Association, together with the highly interesting paper by Mr. G. D. Alexander, of Glasgow, on gas-meter survey work.

Researches on the Chemistry of Coal.—There has been reprinted in pamphlet form, from the Proceedings of the Royal Society, a paper entitled "Researches on the Chemistry of Coal: Part II.—The Resinic Constituents and Coking Propensities of Coals," by Dr. William A. Bone, F.R.S., Mr. A. R. Pearson, M.Sc.-LL.B., Mr. E. Sinkinson, B.Sc., D.I.C., and Mr. W. E. Stockings, M.Sc. The paper embodies the results of experimental investi, gations, carried out during the past five years in the Fuel Laboratories of the Imperial College of Science and Technology, into the resinic constituents of bituminous coals and their supposed determining influence upon the coking propensities thereof.

PERSONAL.

The question of the appointment of a successor to the late Mr. Isaac Carr as Gas and Water Engineer was before the Widnes Town Council of last week, when the Gas and Water Committee's recommendation that Mr. CHARLES E. DICKINSON be appointed was carried unanimously; the salary to be an inclusive one of £700 per annum. Mr. Dickinson, who is 37 years of age, has been nine years in the department, under Mr. Carr, and reference was made to the useful experience he has gained during this period. As to Mr. Dickinson's previous career, his studies for engineering were pursued at Wakefield Technical School and the Municipal School of Technology, Manchester. He served his engineering apprenticeship with Messrs. E. Green and Sons, Wakefield. After a term with Messrs. B. & S. Massey, of Manchester, Mr. Dickinson joined the staff of Messrs. Cochrane and Co., of Middlesbrough. Here he was chiefly engaged in connection with works extensions, and upkeep and alterations of existing plant. Prior to joining the staff of the Widnes Corporation, he was for a period of over three years engaged as a draughtsman and assistant with the Leicester Corporation Water Department. Nine years ago Mr. Dickinson was appointed draughtsman at the Widnes Gas and Water Works, and after being made chief draughtsman and general works assistant, he was appointed Deputy Engineer and Manager two-and-a-half years ago, on the death of Mr. H. Mercer. During his period of service, the gas-works have been reconstructed, at a cost of about £36,000. He was responsible for the preparation of plans, and the setting-out and supervision of the blue water-gas plant. He also assisted Mr. Isaac Carr in the preparation of plans for the construction work and extensions to the various gas-works to which he was consultant.

Mr. W. G. S. CRANMER, Engineer and Manager of the Willenhall Gas Company, has again been nominated for a seat on the Short Heath Urban District Council.

Mr. E. HORTOP, A.S.A.A., of the Barrow-in-Furness Corporation, has been appointed to succeed Mr. H. Barton, A.S.A.A., as Chief Accountant to the Aldershot Gas, Water, and District Lighting Company.

Mr. RICHARD CRABTREE, who, as already intimated, has retired from the Secretaryship to the Hebden Bridge Gas Board, was last week the recipient of a smoker's cabinet, the gift of the Directors and his colleagues.

Mr. WILLIAM BARCLAY MAITLAND, D.S.O., of the South Metropolitan Gas Company, has been appointed Superintendent of the Malta Gas-Works, in succession to Mr. A. R. THOMAS, who has returned to England on account of ill-health.

Mr. FRED CHADDERTON, Gas and Water Manager to the Barrow Corporation, has been suffering as a result of a complication following a serious illness some time ago. We are glad, however, to learn that he is now making very satisfactory progress.

The Belfast Gas Committee and the staff of the gas department have presented a Chesterfield, two easy chairs, and a solid silver salver to Mr. DAVID CREIGHTON on his retirement from the position of Collector and Cashier. The gifts were handed over by Mr. M'Keag, the City High Sheriff, who apologized for the unavoidable absence from the ceremony of the Lord Mayor (Sir William Coates). Other members of the Corporation joined in cordial tribute to Mr. Creighton's efficiency at work, and to his fine personal qualities. The compliments were acknowledged in suitable terms by Mr. Creighton.

OBITUARY.

The death is announced of Mr. THOMAS WILSON, who in 1916, owing to the state of his health, resigned the position of Engineer and Manager of the Coatbridge Gas-Works, which he had occupied for the long period of 35 years. The Company, however, retained his services as Consulting Engineer. Mr. Wilson passed away on the 8th inst. in his seventy-third year. Before going to Coatbridge, he was Manager at New Milns, then to the Sutton, Southcoates, and Drypool Gas Company, and afterwards at Saltcoats. In 1898, he was President of the North British Association of Gas Managers. One son, Mr. Andrew Wilson, is Engineer to the Australian Gas Light Company, Sydney, and another, Mr. William Wilson, is Gas Engineer to the Corporation of Burton-on-Trent.

A Guide to Advertising.—Quite a useful and instructive little book, bearing the title "The Business Man's Guide to Advertising," has just been published (price 3s. 6d. net) by the firm of Sir Isaac Pitman & Sons, Ltd. In the space of its 121 pages of text, the author, Mr. Albert E. Bull, has dealt in a chatty, but convincing, way with the several branches of his subject. After warning his readers of the risk of "get-rich-quick" advertising, he proceeds to deal, in the twenty-one chapters into which the book is divided, with the various methods open to attract and interest prospective customers. While, generally speaking, the presumption of the book is that the advertiser is seeking to build up a general trade, special cases are also covered by the author.

ELECTRICITY SUPPLY MEMORANDA.

WHEN there are differences of opinion on any subject that postulates a primary need, there will be differences of opinion as to the means of giving effect to it. It was so with the electricity generation reorganization and concentration projects.

One View of the Bill.

There are a great number of men in the electricity industry who think that the schemes for joint authorities, with powers over electricity generation and transmission to distributing undertakings, are something altogether redundant; while there are others who hold the contrary view. This being so, it is quite natural that there should be a divergence of opinion over the new Electricity Supply Bill which is intended to finance the joint authorities. Some men say it is just what is wanted; others that it is not required, and that it is a product of ingenuity that is not so innocent as it looks. The "Electrical Review" is a paper in the former category; "Electrical Industries" is one that comes in the latter class. It is interesting to read the two views. Take "Electrical Industries" first. It smiles contemptuously at the description that the Bill is non-contentious, and characterizes this as a piece of parliamentary humbug. "The Electricity Commissioners and the Ministry of Transport know quite well that any attempt to confer rate-aided financial powers on joint electricity authorities would meet with strenuous opposition." Then, in order to discount objections, the official case is that joint authorities are unable to do anything towards a cheap and abundant supply of electrical energy unless these financial powers are granted. Stagnation is held up to scare people who do not like the idea of generation being put in the hands of large amorphous bodies composed of representatives of local authorities, companies, railway companies, labour, and other interests. This is a bogey. There is not a single item in the immediate programme that could not be effected by existing interests and statutory powers. The problem of the super-station which bulks so largely in the popular imagination, but is not nearly so important for the present at least, may be solved without committing this highly speculative business into the hands of imitations of the Metropolitan Water Board. Far from being a little innocent, the new Bill, our contemporary holds, embodies a most dangerous policy.

And the Other View.

Then there is the other opinion—that of the "Electrical Review"—narrow-minded in some respects; inordinately satisfied with the proposals in other directions. It reviews the main purposes of the Bill; but it lays great stress on the one which is something altogether apart from the financial proposals. That is the clause dealing with methods of charging. The section in question is No. 14, which abolishes the obligation to provide a tariff based solely on the actual amount of energy supplied. Through this it will be possible to adopt the multi part, the rateable value, or any other system of charging approved by the Electricity Commissioners, without stultifying it by the offer of a flat rate. Narrow-mindedness peeps out here: "It is to this clause that opposition may be raised by some who fancy that they act in the interests of the consumer, and possibly by the gas interests." The gas interests, in the electrical imagination, are mostly at the bottom of the electricity industry's troubles. It rather shows, however, that the gas interests are something potent in respect of trading rivalry, despite the notion in some crazy-brained electrical quarters that the gas industry is in a moribund condition. However, the "Review" says indications are not wanting that the passage of the Bill will be strenuously resisted (this is the non-contentious measure!) both in Parliament and in the Financial Press. To two considerations, however, our contemporary seems to attach great weight. One is that the Electricity Commissioners will have control over the joint authorities; and for the judgment of the Commissioners, the "Review" entertains the utmost respect and confidence. The other is that expenditure is absolutely necessary, and that, if it is not controlled and co-ordinated, the aggregate outlay will be vastly greater. And so our contemporary trusts the Bill will pass, believing that the effect will be beneficial to the electricity supply industry and to the nation.

Gas-Works Secrete Electric Plant.

If it were true, we should be thoroughly ashamed of gas-works. But it is not. A correspondent signing himself "Gas-filled" (the suitability of which pseudonym we do not dispute) alleges that they do secrete electric plant. He alludes to the plan for erecting a power station at Beckton, and utilizing fuel from the gas-works; and he makes light of the advocacy of Mr. Seabrook of joint working to secure maximum fuel economy. He asks: "Does Mr. Seabrook want gas companies to control electricity stations?" The question is followed by these remarks: "If so, let him consider how electricity is viewed at the Beckton Gas-Works. In certain retort-houses there they use electric power, because it has been proved better than hydraulic and compressed air. The motors, however, are very carefully hidden away or covered up lest they should be seen by visitors. The electrical repair shop is in a remote corner of the works, and on visiting days the door must be kept locked 'by order.' Why, then, if electricity is efficient, do they desire to keep it out

of sight?" "Gasfilled" must have taken leave of his senses; and our contemporary did not do a kind thing by publishing his letter. The motors are "carefully hidden away" or "covered up!" This is funny. The motors are on the machines which traverse the retort-houses, and the operating parts of which rise and fall by electrical operation to the various levels of the retorts. Such protection as the motors have is for the purpose of keeping them free from smoke and dust; and we suppose electrical engineers who are not gasfilled will agree that it is a wise act to afford whatever protection is possible where coal is being charged into retorts, and hot coke discharged from them. Anyone who examines the machines can see quite plainly they are electrically operated. The letter is really too silly to waste more time and space over it.

At the Ideal Home Exhibition.

There is a large variety of electrical appliances on view at the Ideal Home Exhibition. The general lighting of the place is electrical; but the gas stands demonstrate that beauty is not a monopoly of electricity, and that effective lighting—soft, well-diffused illumination—is on the side of gas. Otherwise, the things electrical that predominate are the domestic labour-saving appliances, which some electricity supply undertakings like to see adopted by tapping the lighting circuit, so that more current is consumed at lighting rates. Those who want to see this use of "lighting-rate" current find in it something to set against any favourable feelings they have for the bi-part system of charging, or duplicate wiring, so that these appliances may gain the advantage of lower rates. There was a striking display of such appliances—particularly vacuum cleaners and irons—at the exhibition. There were also electric-heaters. Some makers have still in stock the old lamp form of radiators; and they brought them along to the Ideal Home Exhibition, while their proper place should be in a museum. Portable electric-heaters, with their high-heat concentration, were shown on several stands; but they are of little use for the general heating of a room. If one used this form of heater on a cold day for personal warmth, it would be necessary to have a heater in front, one at the back, and one on either side; and if there is more than one person in the room, then it would be essential to take turns between the battery of heaters to get a warming-up. There were also to be seen those mirth-provoking electric "coal" frauds, produced by an electric lamp being embedded in imitation fuel with coloured material to give a red glow, and no heat. We found people smiling at them quite good-naturedly; but they were not struck, and they were not buyers. This sort of thing will do much to bring electric heating into ridicule. Electric ovens were also on view, but tending rather to the small-type ones. On our visit, we did not find at any stand any particular energy in pressing them upon attention. Salesmen know that prices are against them; and questions as to consumption of current for cooking—including the heating elements on the top or at the sides for boiling, &c.—are very awkward to deal with. The same with heating stoves—particularly when the inquirer has only a lighting circuit, and hears that a 3 KW. heater, when full on, would cost, say, at 8d. per unit, 2s. per hour; and even at a power rate of 2½d. per unit, 7½d. per hour. Water-heating was not being lavishly demonstrated. We missed those large storage cylinders, into which current trickles for many a long hour, and in time heats enough water for one person's bath!

Externally Heated Gas-Ovens.

Reverting to cooking appliances, it is observed that the writer of "Cooking and Heating Notes" in the "Electrical Times" has just discovered that the gas industry has cookers with enclosed ovens, externally heated. This is regarded as a compliment to the electric-cooker; but the ill-informed writer is not complimentary to gas or to the enclosed gas-cooker, though he no doubt secretly wishes that the positions in respect of magnitude of electric cooking and gas cooking could be reversed. He says: "Gas people would assure us there are no ill-effects from permitting the products of combustion to play upon the food; but one cannot help wondering at the clumsy endeavours made to avoid just that thing." Are there any "ill-effects" from carbon dioxide and water vapour? If so, why are we all alive to-day, including the gentleman who, we infer, harbours the idea that there are ill-effects? As to the "clumsy endeavour," these enclosed gas-ovens with external heating are far from being new things. There are chefs in the West-end—not writers of "Cooking and Heating Notes"—who know of nothing better to satisfy their requirements. Long before the war this type of gas-cooking range on the large scale was in use in the West-end; and had it not been for the war, they would no doubt have been more extensively applied. The domestic types have been designed to meet the requirements of people who fancy there is something harmful about the products of combustion of gas. But these people are few in the multitude of gas-cooker users. All the same, external heating lends itself to very exact temperatures inside the oven, and through the controlled circulation of the hot products of combustion to very economical heating.

Rental Wiring.

It is well to note new enterprise on the part of our electrical rivals. The prices of materials and labour having fallen, there is a disposition to consider the question of how best to get wired other classes of property—property which admittedly will be less revenue-yielding than existing wired property. The "Electrician" calls attention to a rental-wiring scheme that the Eastbourne Corporation have introduced. A form of agreement has to be filled-up by the tenant, and his landlord has to sign it. An installation must be of not less than four points, or not more than six. This remains the property of the Corporation; and the wiring rental is 7d. per point per quarter. It is noted that "wiring" only is mentioned; and this is going to be placed in the hands of the local contractors. Inclusive of plain pendants with lamps and opal shades for a six-light installation, the cost it is estimated will be £9; and the rental charge would be 15 p.ct.—27s. per annum, or 6s. 9d. per quarter, or 1s. 1½d. per point per quarter. Our contemporary regards these figures as rather high, and thinks there will not be great success unless they are modified. It consequently advises what is currently so fashionable—hire-purchase.

Corporation Tax.

It has been seen that at recent meetings of gas companies, the first steps have been taken to raise the interest of share and stock holders in the subject of the Corporation Tax—that iniquitous piece of taxation that is over and above all other forms of ordinary taxation. The exemption from the tax of public utility companies expires on Dec. 31 next; and it is therefore time that steps were taken to prevent its imposition in their case. It simply means, if imposed, an increase in the charges to the general public for absolute necessaries. In the case of gas companies, it further amounts to an additional tax upon a considerable number of poor householders of the prepayment class. The electricity companies are now raising their voices against the imposition of the tax. At the recent meeting of the St. James' and Pall Mall Company, the Chairman (Mr. Walter Leaf) made his protest. He also called attention to a curious point. Certain of the electricity supply companies in London are partly supplied with electrical energy by a joint piece of enterprise, known as the Central Company. A claim has been made upon the concern for the Corporation Tax. The Company only supplies other companies whose charges are limited; and therefore it is evident the price per unit charged by it could not exceed that charged to the public. The claim was made upon the ground that the Central Company's Act does not expressly include a limitation. If the claim were valid, the amount of the tax would have to be added to the prices charged to the receiving companies; so that, in spite of the present exemption, they would actually be subject to the tax. This is manifestly wrong; and so the claim is being resisted to the utmost. The St. James' Company are, with other companies, also taking steps to represent to the Government the injustice of the tax, which is really an additional income-tax upon those who hold ordinary shares in joint-stock enterprises.

NATIONAL GAS COUNCIL.

Meeting of the Central Executive Board.

A Meeting of the Central Executive Board of the National Gas Council was held on the 14th inst. at No. 30, Grosvenor Gardens, S.W.—Mr. D. MILNE WATSON (the President) in the chair.

Arising out of the minute of the last meeting, dated Feb. 14, dealing with the difficulty in disposing of the effluent from ammonia plant belonging to gas undertakings, a Sub-Committee, consisting of the following representatives, were appointed to investigate the question and report back again to the Board:

Mr. C. F. Botley, of Hastings.
Mr. R. W. Edwards, of Aldershot.
Mr. A. A. Johnston, of Brentford.
Mr. W. E. Price, of Hampton Court.
Mr. P. G. Winstanley, of Wolverhampton.

It was also decided to send a communication to members of the Council asking for their experience in this matter.

ELECTRICITY (SUPPLY) BILL (HOUSE OF LORDS).

This Bill was considered, and the proceedings at the second reading of the measure in the House of Lords were reported. The Board approved the steps which it is proposed to take for the protection of the industry with regard to this measure.

CORPORATION PROFITS TAX.

The course which the Council are taking with a view to retaining exemption from this tax was reported, and approved by the Board.

APPOINTMENT OF GAS EXAMINERS.

The proceedings at the deputation from the Council to the Gas Referees on Feb. 21 with regard to the appointment of Gas Examiners were reported. The Gas Referees outlined the form of the General Notification which they were preparing. The deputation expressed themselves generally satisfied, subject to a longer time than two months being allowed for any extensive alterations to the distribution system which were needed to fulfil the pressure requirements of the Act. The Referees undertook to reconsider this point, and to send the Council a draft of the General Notification for comment before it was passed for issue. It was decided to leave the matter in the hands of the managers in consultation with members of the Committee dealing with this question, in

order that any points in the draft notification which appeared to require amendment might be taken up with the Gas Referees immediately. A long discussion ensued with regard to the necessity for ensuring that the Gas Examiner was "impartial;" and it was decided that gas undertakings who considered that any appointment was unsatisfactory from this point of view should immediately communicate with the Council.

Railway Rates.

Mr. Ogilvie reported the proceedings of a deputation from the Council which appeared before the Railway Managers at the Railway Clearing House on Feb. 21 with regard to additional reductions in railway rates for coal and coke. It was urged that from the point of view of trade in general there was great need for additional reductions in the rates for coal and coke. The present burden of railway rates was a considerable one for the gas industry; and it was absolutely necessary to obtain further reductions. Illustrations were given as to how seriously the gas industry was affected by the present rates in various parts of the country. It was urged that the gas industry formed the starting-point of a very large proportion of railway traffic, having regard to the fact that for every ton of coal carbonized, 10 cwt. of coke was produced for sale, in addition to the tar and various other products. A reduction in railway rates would, it was hoped, enable the gas industry to decrease the price of gas; and this would, in turn, increase the sales of gas and so increase railway traffic in coal and coke. Several instances were quoted where the high railway rates rendered it necessary for gas undertakings to take their coal by water; and unless railway rates were reduced there would certainly be a decrease in railway traffic. The concessions which the Council urged were as follows:

1.—Abolition of the flat rate increase of 4d. per ton.
2.—Further reduction in the percentage increase.
3.—Reduction of the 4s. "maximum" to 3s. at least.

With regard to Scotland, it was urged that these concessions should be extended to there also; and it was pointed out that the Scottish Railways had already granted some concessions to blast-furnaces. It was claimed that at least the same concessions should be granted to gas undertakings in Scotland as had been granted to the blast-furnaces.

Representatives from the Birmingham and Coventry Gas Departments placed the case of their respective undertakings before the railway managers; and Mr. M'Lusky, of the Glasgow Corporation Gas Department, spoke on behalf of Scotland. Mr. F. Tatlow, the Chairman of the Railway Managers, said that the Council had not made an unreasonable case for the particular trade. The matter would have to be thought out and considered with the cases of other trades. If they could see their way to make any reduction in the present rates, they would be glad to do so.

Standardization of Cookers.

It was reported that the Committee dealing with this matter were to meet on the following day, when their work would be practically completed, so that a full report would be before the Board at the next meeting. It was unanimously agreed to ask the Committee to continue their most useful work, and to take up the question of the standardization of other gas appliances.

Sulphate of Ammonia.

Gas undertakings were urged to do everything they possibly could to increase the output of sulphate of ammonia immediately, to cope with the extraordinary demand for home consumption. It was reported from various districts that active steps had already been taken to urge upon undertakings the necessity for increasing the output of sulphate of ammonia forthwith.

Incandescent Street-Lamps in America.

Some figures with regard to the use of gas in incandescent street-lamps throughout various towns and cities of the United States were quoted by Mr. F. Victor Westermaier, in the course of a paper presented by him at last month's annual convention of the New England Association of Gas Engineers. He said that incandescent gas street lighting had its beginning in the States in 1896, with the installation in that year of 285 lamps. Its growth for a period of eighteen years was phenomenal, reaching the maximum in 1914, with a total of over 230,000 lamps. With incandescent lighting came a new order of things in gas street lighting—the retirement of gas companies as municipal lighting contractors, and the evolution of service organizations, whose sole business is to use the gas of the local companies in carrying out their contracts for gas street-lighting service. How well this arrangement has succeeded is shown by the fact that in no large city where the street lighting was taken over by the street-lighting company has the use of gas in that field been eliminated; and to-day 200,000 incandescent mantle lamps in approximately 180 towns and cities from the Atlantic to the Pacific are maintaining the best traditions of gas lighting in direct competition with electric lighting service, and in spite of the widespread propaganda to eliminate gas as an illuminant. The total annual consumption of gas by these street-lamps is approximately 3000 million c.ft.; sold by the local gas companies to the cities, either directly or indirectly through the service companies. To maintain gas in the field of public service, the companies have had to expend millions of dollars of capital, on which the financial return in the last few years has been sadly out of proportion to the risks assumed and the energy expended.

NATIONAL BENZOLE ASSOCIATION.

Annual General Meeting.

The Third Annual General Meeting of the Association was held last Wednesday, at No. 30, Grosvenor Gardens, S.W.—Mr. D. Milne Watson (the President) in the chair.

The President, in his report, informed the meeting that arrangements had been entered into with the Leeds University for the purpose of carrying out research work in order to increase the supplies of benzole.

Prof. J. W. Cobb, of Leeds University, then briefly alluded to the work which was being undertaken.

Officers Re-Elected.

The President, Vice-Presidents, and Executive Committee were unanimously re-elected. They are as follows:

President—Mr. David Milne Watson.
Vice-Presidents.—Mr. J. H. Ellis, Mr. S. Henshaw, Sir A. F. Pease, Bart.
Chairman of Executive.—The President.
Executive Committee.—Representing Scotland: Mr. J. T. Forgie. Representing N.W. England and N. Wales: Mr. N. N. Holden. Representing Midlands: Mr. H. W. Robinson, Mr. A. W. Smith. Representing N. England: Mr. R. D. McCowan. Representing W. England and S. Wales: Mr. W. R. Hann. Representing N.E. England: Sir A. F. Pease, Mr. W. L. Johnson, Mr. A. Read, Mr. Basil Sadler. Representing Yorkshire, Staffs, and Derby: Mr. S. Henshaw, Mr. J. L. Major, Mr. E. E. Barnes, Mr. A. Stanley, Mr. A. W. Westlake. Representing the Gas Industry: Bailie Thomas Paxton, J.P. (Glasgow), Mr. J. H. Canning (Newport), Mr. J. H. Ellis (Plymouth), Mr. C. S. Shapley (Leeds).
Secretary.—Mr. P. G. Somerville.

The following members have been co-opted to advise in all technical matters: Mr. W. G. Adam (London), Mr. E. Bury (Saltburn-by-the-Sea), Dr. E. W. Smith (London).

Joint Benzole Research Committee.

The Joint Benzole Research Committee consists of the following:

Representing the University.

Prof. J. W. Cobb, C.B.E., B.Sc., Professor of Coal Gas and Fuel Industries.
Prof. J. B. Cohen, B.Sc., Ph.D, F.R.S., Professor of Organic Chemistry.
Prof. A. G. Perkin, F.R.S., Professor of Colour Chemistry and Dyeing.
Prof. Granville Poole, B.Sc., M.I.M.E., Professor of Mining.
Prof. A. Smithells, C.M.G., B.Sc., F.R.S., Professor of Chemistry and Pro-Vice-Chancellor of the University.

Association Representatives.

Mr. W. G. Adam, B.A., F.C.S., M.S.C.I.
Dr. T. Howard Butler, Ph.D, M.Sc., F.I.C.
Mr. S. Henshaw, F.I.C.
Mr. S. A. Sadler.
Dr. E. W. Smith, F.I.C.

THE CHEMISTRY OF COMBUSTION.*

Recent years have seen a growth in the publication of monographs on selected branches of science and technology. Written by specialists giving authority to the subject matter, such monographs may prove more valuable and welcome additions to technical literature than some more bulky but less trustworthy works. The little book under review is one of a series which purports to be of this type—being "intended primarily for advanced and Honours students," and also "those engaged in research." The subject has a wider appeal, for readers of the "Journal" are the practitioners of combustion and have a use for a work on its principles. It is an appropriate theme for a British writer. British chemists have been prominent in elucidating the problems of combustion. This was true of the old chemical masters, and is not less true of the present generation. It invites, then, comment that no monograph has appeared, collating and sifting the bibliography, and presenting the results clearly and concisely. A debt of gratitude would be due to its compiler. Perusal of this book to see if the author had at last succeeded, led to some disappointment. It may be allowed that he has provided a stop-gap, but he certainly has failed to fill the breach, though perhaps this is an impossibility inside one hundred pages.

In the first section great play is made with the importance of accurate definitions, but the author himself is not always happy. Such a fundamental one (to take an example) as that of flame (p. 6) will not command general approval—viz., "a mass of gas raised to incandescence by heat." Does the author think that the chemical and physical phenomena of flame can necessarily be produced by heating a mass of gas? If so, to what temperature? In a dust-free atmosphere the flame of pure hydrogen cannot be seen but only felt. On p. 92 there appears a generalization judged

* The Chemistry of Combustion. By J. Newton Friend. "Chemical Monographs." London: Gurney & Jackson. Price, 2s. 6d.

to be sufficiently important to merit italics. "The property of accelerating gaseous combustion at temperatures below ignition point is shared by all substances irrespective of their chemical composition." Though the author's meaning may be divined, surely one may expect more care and precision in drafting what he regards as a specially important statement. As it stands, the sentence is nonsense.

After a short historical section on phogiston, an account is given of the combustion of carbon, and especially of the work of Rhead and Wheeler on the absorption of oxygen by carbon. At the end of this section appears a paragraph apparently intended to give the theory of the air-blown coke producer. The contents are, however, too brief and superficial to be of value to anyone but an elementary student. Readers of the "Journal" looking for the theory of such an important operation would be disappointed, and not less so by the next section dealing with the candle and coal gas flames, both of interest to gas chemists. The reviewer does not think the author is faithfully reflecting current opinion in his treatment of the luminosity of flame, and particularly in the prominence given to the hydrocarbon theory of luminosity and to the effect of increased pressure on luminosity. Sir E. Frankland's observation that a flame burns under pressure more brilliantly than in the open air was interesting, but it is misleading to mention in a breath with the incandescent gas-mantle the increased luminosity of a hydrogen flame burning under pressure (p. 24). The treatment of the bunsen flame is also disappointing. On p. 33 appears a laboured and dubious explanation of its want of luminosity. Surely it can be found in diagram 6 (p. 29). Such an important matter as the temperatures attained in the bunsen flame receives meagre attention, and the little information given seems to be drawn from earlier and less trustworthy sources. The more important researches find no mention in the bibliography.

Later chapters deal with ignition temperatures and the propagation of flame through gases. The work of Dixon, Wheeler, Bone, and their collaborators is treated. Coward's work on limits of inflammability has apparently been overlooked. Wheeler's data on speeds of propagation in flame and the important generalizations he has made are only very incompletely handled. Fig. 21 (flame speeds of different gases) could have been made much more informative.

In conclusion, it may be said that the book contains a considerable amount of information (hitherto only to be found scattered in journals) and a bibliography, by no means complete, rendering it of some limited use to a discriminating reader. It is not, however, likely to be regarded as an authoritative work on this subject.

H. J. Hodsman.

CRUDE GAS LIQUOR AS FERTILIZER.

Continual rises in German railway freights have had the effect of making it more and more impossible for gas-works to send away low-grade liquor to be worked-up into sulphate, so that the question of using the crude liquor itself as a fertilizer has assumed considerable importance for those works which cannot make their own sulphate. The "Wirtschaftliche Vereinigung Deutscher Gaswerker," which interests itself in marketing the bye-products of German gas-works, has recently been investigating the subject, and some interesting information is published in a recent number of "Das Gas- und Wasserfach" in an article compiled by Herr Johannes Mews.

Several gas-works have been recommending to farmers for ten or twenty years the use of crude gas liquor, and have been selling it for agricultural purposes at about 3° Beaumé—*i.e.* 1·5 p.ct. of ammonia, or 1·23 p.ct. of nitrogen. Although the liquor contains, besides the beneficial nitrogen, other constituents such as cyanogen compounds, which, in certain circumstances, may be harmful to plant life, experience has shown that, when used according to certain directions, it gives nothing but good results. The gas-works which have supplied it cannot keep pace with repeat orders.

Some Experiences.

One group of big landowners in the Lommatzsch district have testified in the following terms. Any kind of land can be enriched with crude gas liquor. It can be used at any season of the year at any strength between 1·5° and 2° Beaumé, in the same manner as ordinary liquid dung-manure, and for all kinds of produce. The results are far better than with ordinary manure; meadow land especially showing excellent results. The treatment of the latter is best undertaken in dull weather. When the sun is shining fairly strongly there is some danger of burning the grass. The best effect on arable land or stubble is obtained by ploughing immediately after application of the liquor.

Another landowner, who has used crude liquor for ten years, reports that his property is heavy sandy soil. In wet weather, or when snow is lying, he applies the liquor direct at 3° to 3½° Beaumé. Otherwise he dilutes it to 1° to 1½°. Meadow land he only feeds in the winter in rain or when snow is lying. Ground for cereals is treated two or three weeks before sowing, but rain must fall between, as he no longer troubles to dilute the liquor before application. He uses about a ton-and-a-half of liquor to the acre of plough or meadow, and has had up to 50 p.ct. increased fertility for oats and pasture, and somewhat less for other cereals. He had been of opinion until lately that the flavour of potatoes was impaired by using liquor on the land. But last summer (which was so exceptionally hot) he had potatoes planted in land which had been treated the previous year, and the plants remained green much longer than those in ground which had not been treated at all, and the crop was much better. There was no noticeable deterioration in flavour. A diminution of weeds is experienced, and an entire absence of insects and vermin.

General Directions for Use.

The "Wirtschaftliche Vereinigung" has made inquiries among 330 gas-works which have been supplying crude liquor for agricultural purposes for 10 to 20 years, and some of the results of experience with their own land and that of farmers in their various districts are given.

The liquor is generally fetched from the works in barrels or carts, and can be either stored, mixed with other manure, or used at once. Undiluted, it should only be used on fallow land, and, for the best effect, in warm and sunny weather, so that any growing weeds may be destroyed. To avoid evaporation, the ground should, if possible, be immediately ploughed-up. In all other cases, it is better to dilute the liquor with water or liquid farm manure, and warm and sunny weather must be avoided, and rainy weather chosen, if possible. The treatment should be at least a few weeks before sowing, and rain in between is an advantage. Heavy soil should be treated earlier than light. The liquor may be put into the land by means of barrels provided with a perforated pipe like that of a street water cart.

The quantities recommended for use for various crops per acre are approximately: Potatoes in February or March, 720 gallons; vegetables in March, 900 to 1050 gallons; beetroot in April or May before ploughing, 530 to 720 gallons; barley and oats in February or March 800 to 900 gallons; corn and winter wheat in September, 1160 gallons. These quantities are for threefold diluted liquor, so that, as it comes from the gas-works, only 220 to 270 gallons are required to the acre. The dilution may be varied according to the dryness or moisture of the ground, and the prevailing weather.

Special Recommendations.

Meadow and Pasture Land.—This is preferably treated in rainy weather, otherwise the turf is likely to suffer. If there is snow lying, the distribution can be made more even, and the snow causes a natural dilution. According to one authority, who used one part of liquor to five of water during light frosts in February and March, the grass at first turned quite yellow, but became green again with the first warm rain, and remained so until an excellent harvest. Another, who applied one part liquor to two of liquid manure, reports a noticeable freedom from moss, and 20 p.ct. increased fertility. Crude liquor is reported as being unsuitable for clover.

Cereals.—The land must not be treated too copiously, as otherwise the ears become too heavy, and the crop will not stand. Care must be taken that the distribution is even, to ensure evenness of crop. Especially favourable results are reported from several sources with oats, and another user has had great success with rye. The liquor must not, however, be used on growing corn.

Potatoes.—For these, liquor can be used with good results when ploughing, or immediately after planting. But small quantities should be employed, as some report that otherwise the flavour is impaired.

Vegetables.—A number of large growers of vegetables in the Halle district are firmly convinced of the advantages of crude liquor, and are big buyers. Reports have been received of outputs being even doubled.

Fruit Trees.—Crude liquor should not be used for young trees, but older trees, treated in the spring in damp weather, have given very good results. New shoots have appeared, and the harvest has been much increased.

Root Crops.—A large firm in Niedersaida reports treatment with undiluted liquor in autumn or early spring. Development is very noticeable as soon as the vegetation appears, and the rapid growth of the root prevents weeds from getting the upper hand. The effect is equally good in light or heavy soil.

Weeds and Insects.—Reports from all sides are to the effect that weed troubles are considerably alleviated by the use of gas liquor. At the same time, it destroys worms and harmful insects very successfully.

From these details it can be seen that success will follow the use of crude gas liquor as a fertilizer, provided it is applied in a proper manner. The principle must never be forgotten that ammonia should be put into the ground, not on to the plant. If success is not achieved, it is probably traceable to incorrect application of the liquor, and the author considers that, with the help of the above information, any farmer should be able to discover for himself what is best in each individual case.

London and Southern District Junior Gas Association.—At a meeting of the Association on Friday of next week, the 31st inst., Mr. J. S. Thorman, Engineer at the Bow Common Works of the Gas Light and Coke Company, will deliver an address entitled "Some Carbonizing Notes."

North British Association of Gas Managers.—We have received from the Secretary (Mr. David Fulton, of Helensburgh) a copy of the report in pamphlet form of the proceedings at the spring meeting and the annual meeting of the Association last year. It occupies more than a hundred pages, and is followed by a list of officers and members, and of the past-presidents.

THE DETERMINATION OF BENZOLE HYDROCARBONS IN TOWN OR COKE-OVEN GAS.

Under this title, "Das Gas- und Wasserfach" recently gave a description of a method of benzole determination worked out by Herren E. Berl, K. Andress, and W. Müller, which is thought, for convenience and accuracy, to be a considerable advance on any of the methods commonly employed heretofore. In the test described, an active carbon is used, capable of considerable gas or vapour absorption. This can be prepared in various ways.

A U-tube, of enlarged bore at the lower end, and having the arms fitted with glass stoppers, is filled with 30 to 40 grammes of active carbon. Through the tube, gas is then passed at the rate of about 250 litres [8·8 c.ft.] per hour. If the gas is expected to contain 20 to 25 c.c. of liquid benzole hydrocarbons to the cub.m. [about 566 c.c. per 1000 c.ft.], 200 to 300 litres should be passed through an accurate meter and then the tube. More gas should be used if it is poorer in benzole.

When the absorption is complete, the outlet arm of the tube is connected with a condenser, and provision made for the condensates to run into a burette with an outlet tap. The U-tube is then heated by means of a salt bath to between 110° and 120° C., and at the same time steam is blown through it. This is continued until the volume of benzole condensed in the burette is constant, which will take about 30 minutes. From time to time some of the condensed water may be run off, in order to maintain the benzole column within the graduated portion of the burette. A certain amount of the benzole hydrocarbons are bound to stick to the apparatus, so that it is advisable in a separate experiment to replace the carbon by a measured quantity of benzole, distil it over in the same manner by means of steam, and establish as a correction constant the difference between the initial volume of benzole and that condensed in the burette. This difference will not be much over 0·2 c.c. When the distillation by steam is complete, the U-tube is connected to the vacuum pump, the steam-tap is shut off, and the cock further away from the pump is closed. By maintaining the temperature of the bath, the tube and the carbon are freed of water by heat and suction, and the apparatus thus prepared for future tests. The drying process takes about 30 minutes.

This method is said to give good results, and to be considerably quicker than the others. As an example, a test is quoted where the U-tube with carbon was attached behind a paraffin-oil absorption apparatus. The latter was cooled to − 10° C., and gas was passed at the rate of only 45 litres in the hour. The paraffin absorbed only 50 to 53·5 p.ct. of the benzole, the rest passing through to be retained by the carbon. So that the paraffin oil method, according to this, would show only 9·74 to 10·1 c.c. of benzole per cub.m.; while it was found that the dinitrobenzole method gave 16 to 17·2 c.c., and the active carbon test extracted 20·2 to 23·9 c.c.

In the opinion of the writer of the article (the initials—"K. B."—are those of a high authority in the German gas industry) this method of testing for benzole may profitably be substituted for those commonly in use heretofore.

REPORT OF THE CHIEF INSPECTOR OF MINES.

Statistics for 1920.

ACCORDING to Part III. of the report on Mines and Quarries for 1920, which has lately been issued by the Mines Department, over the signature of Mr. Thomas H. Mottram (H.M. Chief Inspector of Mines), the quantity of coal raised during that year in the United Kingdom was 229,532,081 tons—or the lowest figure recorded since the year 1903, with the exception of 1918, when it was 227,748,654 tons. The majority of the pits were idle for two or three weeks during October and November, 1920, in consequence of the national coal-mining dispute at that time.

The total value at the mines and quarries of the 229,532,081 tons of coal raised in 1920 was £396,872,423. The output for 1919 was 229,779,517 tons, and the value £314,113,160. The total for 1918 was 227,748,654 tons, and the value £238,240,760. The output in the year 1917 was 248,499,240 tons, and the value £207,786,894; while in 1916 there was an output of 256,375,366 tons, of a value of £200,014,626. The respective outputs for 1920 were: England, 162,094,221 tons, value £263,242,612; Wales, 35,805,958 tons, value £86,589,221; Scotland, 31,523,941 tons, value £46,859,767; and Ireland, 107,961 tons, value £180,823.

As to the selling price of coal at the mines and quarries in 1920, the percentage increase as compared with 1913 was 241. The average price of coal at the pit was 34s. 6·97d. per ton in 1920, as compared with 27s. 4·08d. in 1919. The price of coal per ton at the mines in the four preceding years was: 1918, 20s. 11·06d.; 1917, 16s. 8·68d.; 1916, 15s. 7·24d.; 1915, 12s. 5·6d. In 1913, the price was 10s. 1·52d. per ton. These figures include the estimated market value of the coal used at colliery engines, and of the coal supplied to miners. During the whole of the year, it is pointed out, the selling price of coal at home was controlled, and was considerably lower than coal used for bunkering vessels, and lower still than coal sold for shipment abroad.

Of anthracite (the figures relating to which are included in the statistics relating to coal), the output for the year 1920 was 4,538,960 tons, having a value of £9,681,923. For 1919, the output was 4,236,256 tons, of a value of £6,426,283. Of the 229,532,081 tons of coal produced during the year 1920, there was exported in the form of coal, coke, and manufactured fuel, and for use in steamers engaged in the foreign trade, 43,675,557 tons, leaving 185,856,524 tons of coal available for home consumption, or nearly 4 tons per head of the population of the United Kingdom based on the estimated total population for the year 1920. During the past 48 years (1873-1920), 9,651,384,000 tons of coal have been raised; and of this amount, 2,314,866,000 tons, or nearly 24 p.ct. of the total production, have been shipped abroad as exports in the form of coal, coke, and manufactured fuel, and as coal used for steamers engaged in the foreign trade. The proportion so shipped abroad in 1920 was 19 p.ct.; and in 1919, 22·3 p.ct. The total quantity of coal used in the manufacture of briquettes in 1920 was 2,266,202 tons, and in 1919 1,885,556 tons.

With regard to coke, returns of production were received from 121 colliery owners (comprising 158 separate works), 1374 gas companies, and 29 other owners of coke-ovens (comprising 35 works). The counties of Durham and York furnished more than 65 p.ct. of the total quantity of coke made at coking-ovens; and 63 p.ct. of the total number of ovens were being worked in those counties. Of the 193 works (other than gas-works) where coking plant is in use, bye-products were recovered in 1920 at 125. In 1919, out of 196 works, bye products were recovered at 117. The total quantity of coal used in the manufacture of coke in 1920 is stated at 37,409,136 tons, as compared with 35,394,055 tons (revised figures) in 1919. The quantity of coke obtained in 1920 was: At gas-works (excluding coke used in the gas-works), 8,307,141 tons; at coke-ovens, 12,611,435 tons—total, 20,918,576 tons, valued at £59,568,810. The value represents the selling price in the coke-yard; and in cases where the coke made was not sold, the value has been estimated. The figures of coke obtained for 1919 were: At gas-works, 7,883,340 tons; at coke-ovens, 11,681,153 tons—total, 19,564,493 tons, valued at £40,653,387. Of the coke obtained from gas-works in 1920, 7,347,893 tons came from England and Wales, 756,386 tons from Scotland, 192,355 tons from Ireland, and 10,507 tons from the Isle of Man.

The output of iron ore in the United Kingdom during the year 1920 amounted to 12,706,895 tons, valued at £9,956,820. In addition, iron ore amounting to 6,499,551 tons was imported into the United Kingdom. The output of oil shale from mines and quarries in 1920 was 2,842,582 tons, valued at the mines at £2,081,307; these figures comparing with 2,763,875 tons, valued £1,567,050, in 1919. The average yield of oil for mines in Scotland is 20 gallons, and of sulphate of ammonia 40 lbs., per ton of shale. During 1920, 2909 barrels, or 375 tons, of petroleum, valued at £8437, were obtained from the well at Hardstoft, in Derbyshire. The total production of this well up to the end of 1920 amounted to 4575 barrels, or 590 tons.

THE "HARDBROOK" AUTOMATIC VALVE.

This valve, which is the joint invention of Messrs. W. G. Harding and A. W. Brookman, is designed for the purpose of closing a passage to the resumed supply of gases or liquids under pressure, after the supply has once failed. It is positive in its action, inasmuch as while failure of supply automatically closes the valve, resumption of supply exerts pressure on the valve in such a direction as to close it tighter on its seating; thus making it impossible for the gas or liquid to pass. Its uses and advantages are most obvious in connection with gas heating and lighting installations where failure and resumption of supply constitute a grave risk of gas escaping from open unlighted jets. It is well known that serious accidents frequently result from this cause.

By inserting "Hardbrook" valves in the pipes leading to the various burners, stoves, radiators, &c., forming a gas installation, such risks are entirely obviated; the closing action of the valve being dependent solely on the failure of supply, and independent of the state of the burners controlled—whether open, closed, or partially open. The valve does not interfere in any way with the ordinary functioning of the burner, which can be opened and closed under normal conditions in the usual manner entirely independently of the valve. Should failure of the supply occur, however, the valve closes; but a resumption can immediately be obtained, when required, by a slight pressure applied to the button, which forms a detail of the valve.

As an instance of its usefulness, the present condition of prepayment slot-meter gas installations may be quoted. Failure of supply frequently occurs in these systems before a coin is inserted in the meter, and the result is that lighted burners become extinguished and gas escapes from the open jet when the supply is resumed. The "Hardbrook" valve prevents this risk entirely, as resumed supply cannot pass the valve until required. Again, in large gas installations where, from motives of economy and safety, it is the practice to shut gas off at the main at night, the supply can be resumed without fear of gas escaping from any open jet controlled by the "Hardbrook" valve.

The valve is simple in construction, and, being threaded with standard size gas threads, can easily be fitted to any existing gas installation or attached to and sold as an integral part of new heating and lighting apparatus. The cost of production is low enough to enable it to be made and sold at a price comparable with that of the standard type of simple gas-fitting units.

A ROUTINE GAS-ANALYSIS APPARATUS.

By R. V. WHEELER.

[Reprinted by permission from "Fuel in Science and Practice," February, 1922.]

The more accurate a gas-analysis is, the greater is its value. In many instances, however, routine control tests do not demand the high degree of accuracy that is obtainable with the more elaborate forms of gas-analysis apparatus; while the simpler forms often do not quite suffice. An adaptation of Hempel's well-known apparatus is described in this article.

Some years ago, when superintending the working of a large gas-producing plant, I found it necessary to carry out routine gas analyses, the number of which imposed a task which became irksome to one who is of a naturally lazy disposition. I therefore sought for means of reducing the amount of labour required in making analyses with the apparatus available—the Hempel—or preferably, so to increase the accuracy possible with that form of apparatus, by eliminating errors that may arise through inattention or carelessness, as to make it sufficiently safe in the hands of a workman or foreman, so that I should be relieved of the labour altogether.

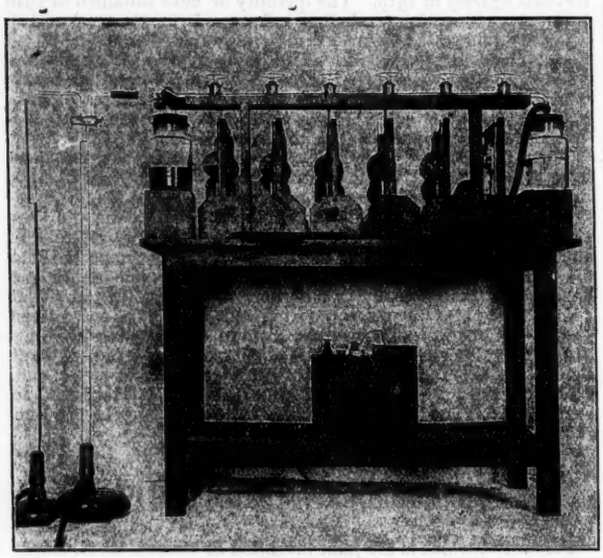


Fig. 1.

The chief opportunity for error when using the Hempel apparatus perhaps occurs when one absorption vessel is detached from the burette and another substituted; it is nearly impossible then to prevent the entrance of a bubble of air. Serious error may also arise through the absence of facilities for washing the gases after their treatment with the various absorbents—after treatment, for example, with ammoniacal cuprous chloride for the removal of carbon monoxide. These two sources of error were eliminated, and the apparatus was rendered generally handier to use, by connecting all the absorption vessels and the explosion vessel to the measuring burette by a system of three-way taps, and by providing washing facilities, in the manner shown in the photograph (fig. 1). As thus arranged, the apparatus resembles in some respects the Orsat.

So far as the analysis of producer gas was concerned, this arrangement of the Hempel apparatus proved very satisfactory; the results obtained with it by the foremen on the plant comparing closely with those given by check analyses carried out over mercury in a research apparatus. Its easy manipulation, as compared with that of the ordinary Hempel burette and bulbs, afforded a notable saving of time.

This apparatus seemed, therefore, by reason of its simplicity, to be a suitable one with which to introduce students to the mysteries of gas analysis, and two examples have been installed in the Fuel Technology Laboratories of Sheffield University for the purpose. By the suitable choice of absorbents, the apparatus has been adapted for the analysis of coal gas and coke-oven gas, as well as producer gas. Its accuracy seems to be sufficiently good for routine work, and the fact that it dispenses with the use of mercury—the bugbear of the student (and of the works chemist?)—stands in its favour for that purpose. A detailed description of the arrangement, and of the manner of using it, may therefore prove of value to others.

The burette and the pipettes are of smaller volume than those usually employed. The burette, which is filled with a mixture of equal parts by volume of glycerol and water, slightly acidulated and coloured by methyl orange, holds about 50 c.c., and has 100 major graduations, each of which is divided into fifths, thus allowing readings readily to be made to within 0·05 p.ct. The graduating lines should preferably be carried completely round the circumference of the burette, in order that, when taking a reading, parallax may be avoided. If the room in which the apparatus is used is subject to wide fluctuations in temperature the measuring tube of the burette should be water-jacketed.

The pipettes are of about 75 c.c. capacity, and of the double-bulb type described by Hempel for use with solid reagents (fig. 2). Each pipette is mounted on a light wooden frame, and is connected by rubber pressure tubing to a limb of the system of capillary three-way T-taps, fused together and mounted on a wooden framework, which is the main feature of the apparatus. This system is shown in plan in fig. 3. The measuring burette is also connected to this system through one limb of a three-way tap, of special form, fused at the top of it. Care should be taken, when attaching the burette and the pipettes to the three-way tap system, that glass abuts against glass beneath the rubber tubing.

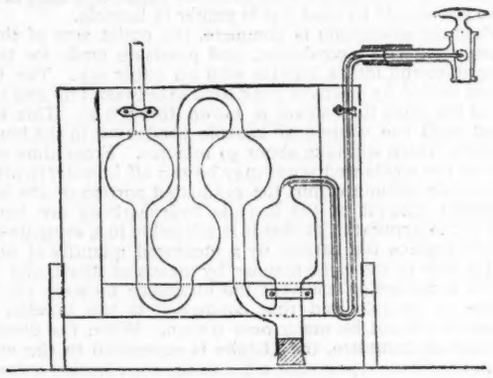


Fig. 2.

The tap system comprises seven three-way taps in series, six of which afford communication between the measuring burette and the various absorption pipettes (five in number) and the explosion pipette, and the seventh, which is nearest to the burette, and is set at right angles to the others, communicates with a catch-bottle for the reception of dilute sulphuric acid, which can be drawn from a small reservoir, and is used for washing-out the main capillary tube of the system. The whole apparatus was made for the Sheffield University by Mr. J. C. Cowlishaw, of Chester Road, Manchester.

METHODS OF ABSORPTION AND EXPLOSION.

The absorption pipettes for an analysis of coal gas or coke-oven gas contain, counting from that nearest the measuring burette:

(1) Dilute sulphuric acid (1 in 10). The gases are passed into this pipette after each absorption, to wash them and to obtain regularity as regards the time taken in transferring them to the burette before measurement. This pipette also serves as a reservoir, in which a portion of the gas remaining after all the absorptions have been effected can be stored while another portion is undergoing explosion analysis. A duplicate explosion analysis can then be made if required.

(2) Caustic potash solution, for the absorption of carbon dioxide. One pound of stick potash is dissolved in 500 c.c. of distilled water.

(3) Alkaline pyrogallic acid, for the absorption of oxygen. One ounce of pure pyrogallic acid is dissolved in 100 c.c. of distilled water, about 25 c.c. of this solution are then poured into the pipette, and about 50 c.c. of the caustic potash solution are added.

(4) Bromine water, for the absorption of unsaturated hydrocarbons (and benzene vapour). Distilled water is saturated with bromine, and about 5 grms. of pure potassium bromide added and allowed to dissolve. After treatment with this reagent, the gases must be washed in the caustic potash pipette, to remove bromine vapour, before undergoing their usual washing in the sulphuric acid pipette.

(5) Ammoniacal cuprous chloride, for the absorption of carbon monoxide. Seventy-five grammes of pure cuprous chloride and 25 grms. of ammonium chloride are placed in a 16-oz. wide-mouth bottle with 200 c.c. of distilled water. Ammonia gas is then passed into the water (air being excluded) until all the cuprous chloride dissolves. A supply of this reagent should be preserved in a number of bottles containing about 75 c.c. (enough to charge the pipette), each containing about 2 grms. of ammonium chloride, and each fitted with a well-greased ground glass stopper. Convenient apparatus for the preparation of the latter reagent is shown in fig. 4.

If the apparatus is required for the routine analysis of producer gas, ammoniacal cuprous chloride may be substituted for the bromine water in pipette No. 4.

The explosion pipette (No. 6) is filled with a mixture of glycerol and water, such as is used in the measuring burette. It is provided with a tap between the explosion chamber and the reservoir, which is closed during the explosion of the mixture.

METHOD OF MANIPULATION.

Before beginning an analysis, observation should be made that the reagent in each of the absorption pipettes completely fills the capillary U-tube and the junction to the three-way tap system, each tap of which should be in the straight-through position. All the capillary connections will then be filled with liquid—those of the burette, and the main connection to the pipettes, with dilute sulphuric acid, and those of the pipettes with the various reagents.

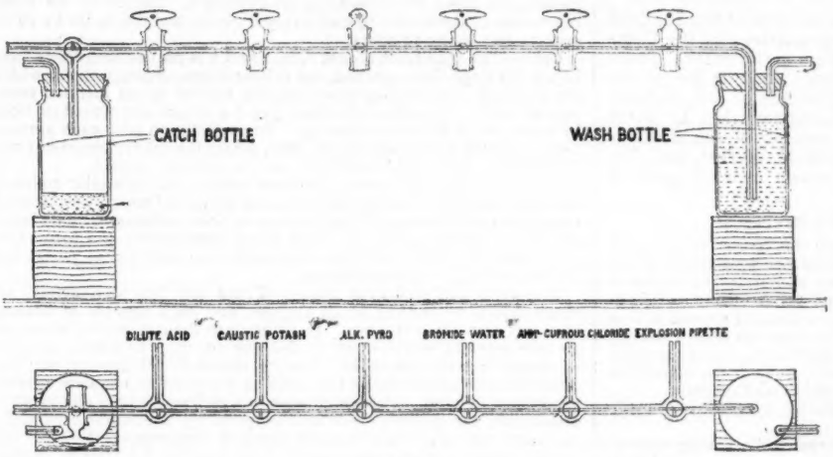


Fig. 3.

A sample of the gas to be analyzed is drawn into the burette through the left-hand limb of the tap at the top, a little more than 100 measures being taken in the first instance. One minute is allowed to elapse to enable the liquid on the walls of the burette to drain down, and then, by suitable manipulation,* exactly 100 measures of the sample are retained.

The first absorption to be made is that by caustic potash. The levelling tube of the burette is raised and the tap turned, so as to cause the gas to flow slowly along the capillary of the three-way tap system. As soon as the gas arrives at the tap leading to the caustic potash pipette, the tap is turned and the gas forced into the pipette. Liquid from the burette is allowed to flow along the main capillary tube until it just enters the tap leading to the caustic potash burette, which is then shut-off.

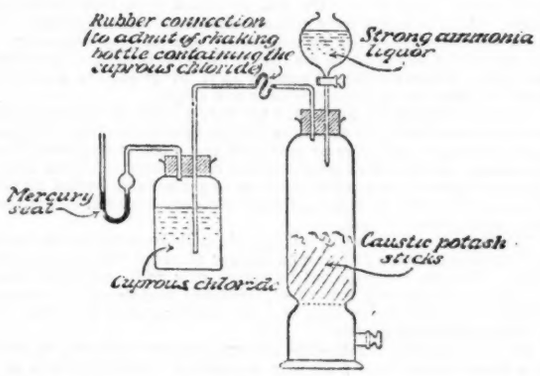

Rubber connection to admit of shaking bottle containing the cuprous chloride
Strong ammonia liquor
Mercury seal
Caustic potash sticks
Cuprous chloride

Fig. 4.

The liquid in the absorption pipette should occasionally be agitated by gently rocking the stand upon which all the pipettes and the tap system are mounted, and the gas should remain in contact with the reagent during one minute. The gas, or most of it, is then withdrawn into the burette, and passed back again into the pipette to undergo further treatment with the reagent during one minute; the same procedure, as regards the passage of liquid from the burette along the main capillary tube, being followed as at first. Finally, the gas is withdrawn into the burette for transference to the sulphuric acid pipette previous to measurement. When doing this, the gas is withdrawn from the caustic potash pipette until the liquid therein just reaches its tap. This is then turned into the straight-through position, so that acid from the reservoir follows the gas in the capillary tube in its passage to the burette. As soon as this acid (and perhaps a trace of caustic potash that has accidentally been allowed to travel past its tap) reaches the tap that communicates with the catch-bottle, the tap is turned so as to make connection between the acid reservoir and the catch-bottle, and a quantity of acid is blown through the main capillary to clean it. The gas can now be passed into the sulphuric acid pipette, washed, and withdrawn into the burette for measurement, acid being allowed to travel along the capillary up to the tap on the burette. As always, liquid should be allowed to drain down the sides of the burette during exactly one minute before the measurement of volume is made.

The manner of conducting the remaining absorptions is similar, except that five minutes should be allowed for the absorption of oxygen, followed by a second treatment during one minute; two minutes for the absorptions with bromine water (which must be followed by washing with caustic potash); and two minutes (twice) for the absorption of carbon monoxide.

Explosion analysis is carried out with a measured fraction of the residual gas, the remainder being stored in the sulphuric acid pipette in order that a repeat explosion analysis can be made if necessary. About 15 measures of coal gas or coke-oven gas, or between 30 and 35 measures of producer gas, should be taken and accurately measured; and the explosive mixture is made by drawing in air until exactly 100 measures are obtained. This mixture is passed into the explosion pipette, the capillary U-tube of which should be filled with liquid from the burette. Both taps on the explosion pipette should be closed before the mixture is ignited. Ignition is by a spark from an induction coil passing across a gap between platinum electrodes fused into the glass at the top of the bulb. If the explosive mixture has been properly prepared, a blue flash should be observed within the explosion chamber.

After the explosion, the lower tap on the vessel is first opened, then the tap leading to the main capillary, and the gases are transferred to the burette for measurement. The carbon dioxide produced on explosion is determined by measuring its absorption in the caustic potash pipette; and, if desired, the excess of oxygen remaining can be determined by absorption in the pyrogallic acid pipette.

The timing of the various operations—namely, the duration of the absorptions and, more especially, the drainage of the burette—should be adhered to. A convenient adjunct to the apparatus, or to any gas analysis apparatus, for this purpose, is a cylindrical graduated sand-glass.

Each analysis, of a coal gas, for example, takes about half-an-hour. Several different samples can, however, be passing through the apparatus simultaneously, each at a different stage of analysis. In this way time can be saved. Four analyses so conducted take a little over an hour.

The Department of Fuel Technology,
Sheffield University.

* A convenient method is to: (1) Raise the levelling tube so that the gas is compressed to a volume of exactly 100 measures; (2) tightly pinch the rubber connection between the levelling tube and the measuring tube; and (3) open the left-hand limb of the tap on the measuring tube momentarily to the air, so as to release the pressure.

Shutting-Off Gas in Case of Fire.

A device for the purpose of shutting-off the supply of gas from the meter in event of fire on the premises has been put on the market by the Automatic Fire-Acting Gas-Valve Manufacturing Company, of Boston, U.S.A. When the heat in a burning building becomes sufficiently intense to threaten the meter, the valve is released, and shuts-off the gas. To instal the valve, a tee is substituted for the elbow, at the meter; and the valve is placed in the top part of the tee. The valve consists of a ball soldered with 155° fusible solder, and the plug. When the meter and lead connections are in danger of fire, the ball drops in the nipple of the pipe leading up from the meter, and immediately shuts-off the gas. To make a seat for the ball, it is placed on the edge of the nipple, and is tapped with a hammer. The valve only operates when the meter is in danger of melting, and the heat too intense for the firemen to shut-off the gas.

At a meeting of the Illuminating Engineering Society, to be held at the Royal Society of Arts next Tuesday evening, March 28, there is to be a discussion on "The Lighting of Public Buildings: Scientific Methods and Architectural Requirements." An account of experimental work and results will be presented by Messrs. E. H. Rayner, Sc.D., J. W. T. Walsh, M.A., M.Sc., and H. Buckley, B.Sc., of the National Physical Laboratory; and some examples of the lighting of decorative interiors will be shown.

Mr. Archibald P. Main, who, with Mrs. Main, has been travelling round the world, was, according to a local paper, enchanted with the beauties of Melbourne. In the course of a talk, Mr. Main referred to the "Main" gas-cooker, as follows: "We began manufacturing them in Glasgow in the late seventies. People then told us that we should be put into gaol for trying to poison the public! One man said to me: 'The Government should prevent you from carrying on this nefarious business!' We have had a representative in Queen Street, Melbourne, for more than twenty years. There are about 130,000 gas-cookers in Melbourne; and it is estimated that 100,000 of them are of the 'Sussex' pattern of which we are the makers."

YORKSHIRE JUNIOR GAS ASSOCIATION.

Visit to the Grimesthorpe Gas-Works.

Members of the Yorkshire Junior Gas Association, to the number of over eighty, paid a visit on Saturday afternoon last to the Grimesthorpe works of the Sheffield Gas Company, by invitation of the Directors and the General Manager (Mr. Ralph Halkett). Several of the Association's leading members are members of the staff at the works.

The visitors, arriving by various trains, gathered at the Sheffield Midland Station, and were met by representatives of the Company, with a special tramcar to convey them to the works. There Mr. Ralph Halkett offered a brief welcome; and the party was divided into small groups, under the guidance of Mr. Halkett, Mr. H. Chamberlain (Engineer to the Company), Mr. L. Bates (Works Superintendent, and a leading member of the Association), Mr. Baker (Manager of the Chemical Works), and Mr. S. T. S. Musgrove. The visitors were shown over all parts of the works.

DESCRIPTION OF WORKS AND DISTRICT.

The Sheffield United Gas Light Company was formed in the year 1844 by the amalgamation of the two companies who supplied the district with gas. The works were situated at Shude Hill (built in 1818, and now occupied by the Company's offices, &c.), and at Effingham Street (built in 1835). In 1850 the Town Council started a Gas Consumers Company, and built a works at Neepsend in 1852. In 1853 this Company applied for an Act of Incorporation, but eventually agreed to amalgamate with the old Company. In 1917, the title of the present Company was shortened to the Sheffield Gas Company.

The Gas Regulation Act was adopted in March, 1921, and a calorific value of 480 B.Th.U. was declared.

The manufacture of gas is carried on at three works having a combined total capacity of 22½ million c.ft. per diem, made up as follows:

Neepsend	10,000,000
Grimesthorpe	10,000,000
Effingham Street	2,500,000
Total	22,500,000

In addition to this, coke-oven gas to the extent of four million c.ft. per diem is available, making a total maximum production equal to 26½ million c.ft. per diem. By the substitution of vertical retorts for a portion of the horizontal plant at the Neepsend works, this maximum capacity will, by the end of this year, be increased to 30½ million c.ft. per diem.

Storage to the extent of 21 million c.ft. is provided at four stations —viz.:

Neepsend	5	gasholders, total capacity	13,500,000
Grimesthorpe	2	,, ,, ,,	3,500,000
Effingham Street	3	,, ,, ,,	3,300,000
Arundel Street	1	,, ,, ,,	600,000
			20,900,000

The distribution department is sub-divided as follows: Mains and services; fittings; meters and workshops; showrooms.

The mains department is responsible for the whole of the distributory system, the area of which is 134 sq. miles. This comprises about 700 miles of mains varying in size from 3 in. to 48 in., and includes 5 miles of high-pressure steel mains fed by two sets of Waller's horizontal double-acting duplex compressors, each direct coupled to a 90-H.P. National gas-engine, and having a capacity of 100,000 c.ft. per hour against a pressure of 10 lbs. per sq. in. This main delivers into the low-pressure system through Reynolds governors at suitable points throughout the district. The gas can be supplied from any of the three works, which are connected by a 30-in. driving main in such a manner that each can supply the others or the district. The pressure is controlled by means of the works' governors, further assisted by six district governors, as there is a difference of 800 ft. in altitude between the lowest and highest points. The department is also responsible for the reinstatement of all streets where mains or service work has been carried out.

The fittings department is responsible for all internal pipework and the fixing and maintenance of meters and appliances for lighting, cooking, heating, and water heating. Included in this department are the furnace and power sections, which are responsible for the supply, erection, fitting, and maintenance of all industrial and power appliances. A furnace demonstration room is available where all types of furnaces may be seen in operation. The cooker cleaning, testing, and brass finishing shops are attached to this section.

The meter department is responsible for the supply and maintenance of all meters. There are in use on the district about 110,000 meters, varying in size from 2-light to 2000-light, practically all of which are of the ordinary wet type. Dry meters are only supplied for gas-engine purposes. Complete repairs, renewals, and testing of meters are carried out in these shops, also the construction of all tinsmith work, such as flues, hoods, trays, lanterns, &c.

The showrooms are responsible for the sale and hire of all the appliances now on the market. Cookery demonstrations are given periodically in a room close to the showrooms.

Grimesthorpe Works.

The Grimesthorpe works are the second largest of the Company's three manufacturing stations, and are situate at the east end of the city on the Midland railway. The works cover an area of 19 acres, and are capable of producing 10 million c.ft. of coal gas per diem.

Coal.—This is received in trucks from the adjoining Midland railway sidings, shunted by the Gas Company's own locomotives either to a hydraulic wagon tipper, which, through the medium of an elevator and endless belt conveyer, 720 ft. long by 2 ft. 6 in. wide, serves one section of the coal bunkers of 15,000 tons capacity, or up an inclined siding, where the coal is delivered direct into the other section of bunkers of 20,000 tons capacity. Ten elevators and hoppers serve to deliver the coal from the bunkers to the charging machines. Five of these elevators are driven by 15-H.P. D.C. motors, and the remainder by 30-H.P. gas-engines.

Retort-House.—The retort house is 670 ft. long by 70 ft. wide, and contains two ranges of 15 beds of 10 retorts, 20 ft. long by 22 in. by 16 in., operated by means of two Fiddes-Aldridge simultaneous charging and discharging machines, one range of 15 and one range of 12 beds of 10 retorts, 23 ft. long by 24 in. by 16 in., operated by two Arrol-Foulis hydraulic charging machines and one Hunter-Barnett hydraulic pusher, the latter machine being in duplicate. The 22 in. by 16 in. retorts are charged with 7¾ cwt. every 6 hours, and the 24 in. by 16 in. with 14 cwt. every 12 hours.

Coke.—The coke from ranges Nos. 1 and 2 is pushed into cages fixed below the stage floor, slacked, and delivered into tipping wagons, which are attached to an endless wire rope and hauled up an inclined tramway to store. The coke from Nos. 3 and 4 ranges is removed to store by means of an electric telpherage. In conjunction with each storage heap is a breaking and screening plant, where the coke is sorted-out into five different sizes and loaded into carts or railway wagons.

Foul Mains and Condensers.—The gas leaving the hydraulic mains is conveyed through a number of 30 in. and 36 in. foul mains, which travel along the retort-house and coal stores to the condensers. The latter are five in number; four of them being atmospheric and formed of 18 in. vertical pipes, and the other with 9 in. horizontal pipes, the bottom section being water-cooled.

Exhausters and Exhauster House.—There are four exhausters, all direct-driven by vertical steam engines, and each capable of dealing with 125,000 c.ft. per hour. In addition to the exhausters, there are air compressors working at 75 lbs. per sq. in.; hydraulic engines working at 700 lbs. per sq. in.; one gas-engine driven booster, and one direct-coupled motor-driven fan, each of 500,000 c.ft. capacity against a pressure of 20 in. Particular attention is drawn to the electrically-driven fan, the motor (which was supplied by Electro-Motors Ltd.) running continuously without any signs of temperature rise, and the starter, which is of the latest drum type supplied by Messrs. Brook-Hirst & Co., Ltd. The same block houses the tar and liquor pumps and hydraulic accumulator at one end, and at the other end two coal-gas meters of 250,000 c.ft. per hour capacity supplied by Messrs. Parkinson and Cowan, and one coke-oven gas-meter of 100,000 c.ft. capacity supplied by Messrs. Braddock. Situated at the back of the engine-house are the blacksmiths, fittings, and joiners shops, over which are the stores and water tanks.

Messroom.—Above the meter-house is a mess and recreation room, which is much used and appreciated.

Boilers.—Steam is supplied to the gas-works by means of six Lancashire boilers 30 ft. long by 7 ft. 6 in. dia., fitted with forced-draught furnaces, preheaters, and economizers.

Washers and Scrubbers.—This section of the plant consists of two Livesey washers, each of 5 million capacity, four tower scrubbers filled with boards, one Clapham washer scrubber and one Holmes washer scrubber, each of 5 million capacity.

Purifiers.—The purifying house is 445 ft. long by 91 ft. wide, and is arranged with ground, first, and second floors, and contains six boxes 74 ft. long by 40 ft. 6 in. wide, and 12 boxes 37 ft. long by the same width. All the boxes have bottom discharge, and the oxide is taken up to the revivifying floor by four hoists operated hydraulically. At the end of the above house are the purifiers for dealing with the coke-oven gas. These are four in number 40 ft. by 37 ft., the boxes being filled by means of an electric telpher and skips.

Sidings.—Within the gas-works are over 3 miles of sidings in direct communication with the adjoining Midland railway sidings. Inside the works the traffic is hauled by means of two locomotives owned by the Company. Attention is drawn to the construction of these engines, which are geared to enable them to negotiate the incline up which wagons are hauled to the road over the coal bunkers. This incline has a gradient of 1 in 32.

Coke Oven Gas.—About 1½ million c.ft. of coke-oven gas is received into the works every day from a battery of ovens situated two miles away. The gas is conducted by means of a 16 in. cast-iron main to the gas-works, where it is purified, measured, and stored. The stream of coke-oven gas mixes with the gas manufactured at these works at the outlet of the meters.

Electric Generating Plant.—The generator-house is situated at the end of a steam boiler range; the plant consisting of two machines of 200 KW. capacity, one being a Bellis Morcom horizontal steam-engine direct-coupled to a Crompton D C. generator, and the other a Crompton rotary converter. For operating the rotary set a supply of current is taken from the Sheffield Corporation supply mains at 11,000 volts, 3-phase, 50 periods through a Reyrolle E.H.T. switch (the property of the Corporation). This switch is direct-coupled to a Crompton E H.T. cubicle comprising air-break isolating switch, oil immersed switch gear interlocked with trip gear having overload and no volt features, current and potential transformers, voltmeters and ammeters. The door of the cubicle is built in two sections, both being mechanically interlocked so that neither can be opened while the cubicle is alive. This cubicle is connected to a 240 K.V.A. oil immersed transformer, the winding of which gives a secondary supply of 6-phase, 160 volt current. Tappings are arranged to give a 3 p.ct. variation either way. The rotary converter receives the supply on to six slip rings through 36 morganite brushes, and is started by means of a resistance starter, two triple pole switches short-circuiting the resistance as the machine pulls into synchronism and attains its normal speed of 1000 R.P.M. The correct polarity is obtained by means of a field splitting switch fixed on the starting panel. The current leaves the machine at 220 to 230 volts D.C. The feeder cables are brought underground through metal pipes to the switch board, where a change-over switch connects either machine to the distributing system.

Gasholders.—These are two in number, each being 151 ft. 6 in. dia., 111 ft. 6 in. high, and of 1,800,000 c.ft. capacity. They are identical in construction, having four lifts, one of which extends beyond the framing. The tanks were constructed by Messrs. Bently's, of Leicester, and the holders by Messrs. Clayton's, of Leeds.

District Governors.—These consist of two 24 in. supplied by Messrs. W. & B. Cowan.

Distribution.—As the quantity of gas manufactured at the Grimesthorpe station is greatly in excess of the requirements of the districts served directly, the surplus is dispatched through a 30-in. cast iron main to the Neepsend and Effingham Street works and Arundel Street storage station, also serving *en route* two trunk distributing mains. The whole of the gas as it leaves the works is sprayed with naphtha to prevent the deposit of naphthalene. 90-160 solvent naphtha of specific gravity ·875 is used, and is pumped at 80 lbs. pressure through 1/4 mm. Kortings jets.

CHEMICAL WORKS.

Adjoining the gas-works and communicating therewith by sidings are the chemical works, which deal with the bulk of the spent oxide and all the ammoniacal liquor produced by the Company's three manufacturing stations. The works comprise a sulphuric acid plant capable of producing 10 tons of 100 p.ct. H_2SO_4 per diem and two 8 ton sulphate of ammonia plants.

Acid Plant.—This consists of four rectangular chambers. Nos. 1 and 4 are 36 ft. long by 24 ft. wide by 30 ft. high; Nos. 2 and 3, 60 ft. long by 24 ft. wide by 30 ft. high. One Glover tower 10 ft. dia. by 31 ft. high, and one Gay Lussac tower 6 ft. 11 in. dia. by 38 ft. high. Eight Wild's mechanical burners, ammonia oxidation plan , nitre pot, process tanks, acid eggs, &c. Between Nos. 1 and 2 chambers is fixed a Kestner fan for producing a more intimate mixing of the gases, which are sprayed with water from the top of the chambers by means of a series of atomizers. The compressed air used for acid elevation is supplied from the gas-works.

Ammonium Sulphate Plant.—This consists of one Holmes 8 ton plant, comprising a Taylor's open injector type saturator and a Wild's patent still, preheater and liming vessel, and Wilton's hydro extractor. In this set the salt can be neutralized by liquid ammonia in the centrifugal, or by either ammonium or sodium carbonate in the mixer on the stage below. The latter machine produces a neutral granular salt which can be bagged as produced. A similar machine is fixed on the opposite side of the conveyor and serves the second set, which consists of a Wilton's closed saturator, still, &c., removed from the old works. The steam supply for these works is provided by two 5000 lb. per hour Stirling boilers fitted with underfeed stokers, burning coke refuse from the gas-works. The chemical works are built on the site of an old colliery, from the shaft of which all the water except for steam raising is pumped to the gas-works. Over the pump-house is erected a reinforced concrete tank, from which the ammoniacal liquor gravitates to the sulphate plants. The space between the bottom of this tank and the flat roof of the pump-house will eventually be utilized as a laboratory, stores, &c.

A WELCOME FROM MR. HALKETT.

After the inspection, the party adjourned to the messroom—an exceptionally large and well-equipped place—for tea, where Mr. Halkett presided, and was supported by Mr. J. C. Hanby, the Secretary of the Company.

Mr. RALPH HALKETT, in welcoming the members, said: It is a very great pleasure to me to welcome your Association here this afternoon, particularly so when I recall the time, ten or twelve years ago, when I was myself a member of the Yorkshire Junior Gas Association. I remember quite well the interest with which I looked forward to the meetings, and especially to the visits we paid to other works and places we were interested in as members of the gas profession. I discovered then that I could never know enough; and the longer I live the more I realize that to hold our positions worthily and honourably we are never finished learning. There is always something to learn, and in these days, with everything changing around us, new problems cropping up every day, vital decisions to be made quickly and definitely, no man can afford to say to himself: Now I know enough, I can take it easy, and things will go on all right—I have a position, and I need not trouble any more. My advice is, never acknowledge to yourself even that you know all there is to know. Never even say that "so and so" is not my job; I do not need to trouble over that.

In our profession, if you wish to hold a responsible position, the chief of the undertaking requires to have a thorough insight into all its branches; or he cannot adequately fulfil his duties, and guide the junior members of his staff. It is from among the junior members of the industry that we look to see promotion, and for them to join the ranks of the seniors; and I watch your doings with the keenest interest. I think your Association is on the right road. You do not confine yourself to one line, but throw your meetings open to all the topics of interest to the profession, whether they relate to the works, to the chemical side, or to the distribution and sales, including mains and fittings; and if you have not already done so, I would like to advise you to give some attention to the rental and finance side.

The country needs cheap gas; and I can assure you that if we would give them what is wanted it is most essential not only to know how to make gas cheaply, but how to sell it and its residuals—how and when to buy wisely and carefully, not only coal, but all the appliances and appurtenances for the distribution side, as also to spend wisely and economically in the installation of the plant and its maintenance. Then attention must be paid to the keeping of proper records, or all the results of work and industry given to wise economy may be frittered away and lost in some other directions.

It may seem to you that I am advocating an impossibility; but I can assure you the required knowledge can be acquired, though not without real work and diligence and the application of all the intelligence and enthusiasm we possess. And it should be done while you are young. The mind and intellect are more readily absorbent, and the enthusiasm of the younger man is keener than that of the older man; while you will find no greater aid to progress than the enthusiasm you bring to your work. In Sheffield, it has required a lot of all these things to carry us through. I trust that what you have seen to-day has been of interest to you all, and that something fresh may have been added to your store of knowledge. We are not yet at the standard at which we are aiming; but I think I can say that we show a great advance on what we were.

The war left the Sheffield gas undertaking in a sorry state Owing to the city's position as the steel centre of the Empire, a tremendous demand was made for munitions. The manufacturers turned to the Gas Company for assistance; and the Company did their best. Day and night the plant at each of the three works was strained to its utmost, and no time could be spared for making repairs. I think when I tell you that at times our pressure was down to as low as from 8 10ths to 5-10ths, and the stock of gas was often down to 500,000 c.ft., you will realize the effort the Company made to meet the requirements, and the condition of the works at the cessation of war. Since then our efforts have been concentrated on bringing our plant up to a proper state of efficiency.

The new chemical works, which was completed in January, is the latest improvement, and the making of acid and sulphate of ammonia has been in operation for a few weeks. The plant is the most modern of its kind; and we look to obtaining excellent results.

We have been taking coke-oven gas for some three years, and up to a point it has been fairly satisfactory. The chief objections are the irregular quality and the stoppage of supplies at the instance of coal strikes. These points require careful consideration when arranging for supplies of this kind. You will understand that, with a declared calorific value, if a variation in the quality of the coke-oven gas takes place, it is a serious and expensive matter, for the make of coal gas has to be dropped in order to bring up the value of the mixed gas to the declared value. With reference to strikes, it is hardly necessary for me to make any remark further than that definite arrangements should be made with the suppliers, or a stand-by plant must be ready, which is a very expensive course to adopt.

It may interest you to learn that at our Neepsend works an installation of Woodall Duckham vertical retorts is being erected with a daily capacity of 4 million c.ft., with coke crushing and screening plant complete, which we hope to bring into operation next August.

Now, I will not take up your time any longer. As I have said, it gives me great pleasure to have you here to-day, because of my past connections with the Association. I trust you will continue with the broad, open outlook with which you face the problems of the day. It is work of this kind that makes membership with your Association of great value, and much good work can be done for the whole profession.

The PRESIDENT (Mr. Peter M'Nab), before calling for a vote of thanks to Mr. Halkett and all who had contributed to making the visit interesting, expressed his pleasure in occupying a platform again with Mr. Halkett after twelve years. At that time, Mr. Halkett was taking an active part as a member of the Yorkshire Junior Association; and although he had since risen high in the profession, he had shown that day that he had not lost interest in the work of the Yorkshire Juniors.

Mr. J. W. LEE (Grassmore), a Past-President of the Association and of the Coke-Oven Managers' Association, proposed a hearty vote of thanks to the Directors of the Sheffield Gas Company, and to Mr. Halkett and his fellow officials. It gave him particular pleasure to do this, because he was himself at Grimesthorpe for some fifteen years; and the visit caused him to think reminiscently about both his days at those works and his more active participation in past years in the Yorkshire Junior Association. As a coke-oven manager as well as a gas man, he was particularly interested in Mr. Halkett's remarks in regard to coke-oven gas for ordinary gas-works. He had been interested in seeing the chart of the coke-oven gas coming into the Grimesthorpe works. He wished to advocate the greater use of coke-oven gas. It was as easy for a coke-oven manager to produce a regular quality of gas as it was for the gas-works manager, particularly for the gas manager in the old days. He himself was at present supplying coke-oven gas direct into his district, without its going through a gas-works at all; and it was operating with every satisfaction.

Mr. J. W. FELL (Nottingham) seconded the vote of thanks, and paid tribute to the character of the Grimesthorpe works.

Mr. E. J. WELLENS (Wombwell) associated himself with the vote, and said it was a great pleasure to be once again with his friends of the Yorkshire Junior Association, whom he had had the privilege of entertaining some years ago at his works when he was at Hebden Bridge.

The motion was carried unanimously.

Mr. HALKETT briefly responded, on behalf of the Directors of the Company and the officers.

The remainder of the evening, until time for dispersal, was passed in a very pleasant manner; the visitors being entertained to musical and other items by members of the Grimesthorpe staff and friends.

IRON CARBONYL IN COAL GAS UNDER HIGH PRESSURE.

A great gas-oil shortage in Germany during the war led to the substitution, from the middle of 1915 onwards, of coal gas for oil gas for railway carriage lighting. Almost immediately after the change, there was observed a sudden depreciation in the lighting capacity of the incandescent mantles, which was caused by a finely-divided brownish-red deposit of ferric oxide on the mantles and fittings. This was traced at once to the presence of iron carbonyl in the coal gas. It was assumed that the iron carbonyl formation was due to the great difference in carbon monoxide content between coal gas and oil gas—the former having 8 to 10 p.ct. by volume, against 0·5 to 1 p.ct. in the oil gas. The circumstances governing the formation of this iron carbonyl, and its prevention, were investigated by H. Bunte and E. Terres, and their conclusions are the subject of an article in "Das Gas- und Wasserfach" (March 11, 1922). As a starting point they established the fact that, when ordinary town gas is burned for 500 hours, there is no trace of ferric oxide on the mantle, so that the origin of the iron carbonyl must be in the pressure storage cylinders of the carriages.

After interesting and thorough investigations, which are described in the article, Herren Bunte and Terres came to the conclusion that iron carbonyl is certainly formed when gases containing carbon monoxide come in contact, in certain conditions, with iron. This does not take place with ordinary illuminating gas in the uncompressed state, but the rate of formation of the carbonyl increases rapidly with increasing gas pressure, though not in any direct proportion, owing to uncontrollable outside influences. The rate of formation is dependent upon the separate pressure of the carbon monoxide, and increases with increasing concentration. The nature of the surface of the iron is an extremely influential factor, and it was found that a scaled surface acts very much more strongly than smooth iron. Any iron surface, however, becomes inactive in time, which seems to be due largely to the presence in the gas of liquid hydrocarbons. These act as a solvent of the iron carbonyl, and, forming a protective coating on the iron surface, considerably diminish the quantities forming in the gas. This was borne out by the experience of the railways, whose troubles in this direction vanished when they had used coal gas for some little time; and naturally, when coal gas is stored under pressure, a certain quantity of liquid hydrocarbons separate out. A high percentage of hydrogen in the gas is a factor favourable to the formation of the carbonyl. About 50° C. may be put down as its favourite temperature. Above 80°, a noticeable decomposition sets in, and at red-heat this is complete, and takes place spontaneously.

As regards prevention of the trouble caused to incandescent mantles, passing of the gas through a red-hot tube, or washing with solvents, such as concentrated sulphuric acid, would certainly be remedies, but they may be ruled out as impracticable. It is far better to prevent the formation of any iron carbonyl; and the authors suggest some kind of gas proof coating on the iron before contact with gas under pressure containing carbon monoxide. Going still further back, a complete solution of the difficulty would, of course, be to free the gas entirely from carbon monoxide before compression, and this could be accomplished by converting it by reduction to a hydrocarbon—*i.e.*, methane, or to carbon dioxide by oxidation. Of these, the former process has previously been shown to be accompanied by corresponding disadvantages, and to be fraught with practical difficulties and excessive costs. There remains only the oxidation to carbon dioxide. This can readily be done with the help of the water-gas reaction. Carbon monoxide, in the presence of a sufficient quantity of steam at suitable temperatures and with suitable catalysers, resolves itself into carbon dioxide and hydrogen according to the equation

$$CO + H_2O = CO_2 + H_2.$$

"B.C.G.A." District Conferences.

Considerable interest will attach to the Manchester (Lancashire Section) district conference of the British Commercial Gas Association being held to-day in Blackburn, under the presidency of Councillor E. Hamer, J.P., the Chairman of the Blackburn Gas Department. A discussion on "Modern Gas Salesmanship—Development and Successes," is to be opened by Mr. H. H. Creasey; while Dr. W. Allen Daley (Medical Officer of Health of Blackburn) will deal with "Atmospheric Pollution in Relation to Health," and Mr. S. Tagg (Preston) with "The Contribution the Gas Industry is Making towards the Solution of the Smoke Abatement Problem." Tea will be followed by a lecture by Dr. C. W. Saleeby on "Life and Light." Next Tuesday, at Bradford, the Manchester (Yorkshire Section) conference will be held, under the presidency of Councillor G. Walker, the Chairman of the Bradford Corporation Gas Committee. In the morning Mr. C. S. Shapley (Leeds) will open a discussion on "Modern Gas Salesmanship;" while in the afternoon Dr. John J. Buchan (Medical Officer of Health of Bradford) will deal with "Atmospheric Pollution in Relation to Health," and Mr. Harold E. Bloor (York) with "Service to Gas Consumers." Dr. Saleeby will give his lecture in the evening.

THE FUEL PROBLEM.

By Dr. C. H. LANDER.

At a Meeting in Swansea on Tuesday evening of the Institution of Mechanical Engineers (South Wales Branch), a lecture was delivered by Dr. C. H. Lander, of the Fuel Research Board, on "The Fuel Problem"—a subject which, as he remarked, is at the present time of unusual importance.

It was pointed out by Dr. Lander that the thermal efficiency of processes of utilization of fuel depends to a great extent upon the form of the fuel; and it becomes necessary to judge in each case whether it is economically sound to use a large amount of heat from a cheap fuel (which, however, cannot be utilized with high efficiency), or, on the other hand, to use a smaller amount of heat from a higher-grade fuel which can be utilized with high efficiency. Sir George Beilby has used the term "availability of heat" in connection with this aspect of the question; a fuel of high availability for a particular process being one whose heat can be used with comparatively high efficiency. All processes of fuel production have for their object the increase of the availability of the heat; and all processes for the raising of availability are accompanied by losses. In coal washing, for example, a proportion of the "fines" is carried away along with the ash in the slurry. In gasification, heat is lost in radiation, and in the condensing and cooling plant. The process itself also involves money expenditure in the form of labour, capital charges, and profit; and since the resultant fuel must bear all these costs, the problem becomes that of deciding whether the increased availability or the heat units in the finally-produced fuel is worth the increased cost. The prices commanded for a therm (or 100,000 B.Th.U.) in various forms of fuel are as follows:

Coal or coke	1d. to 2d.
Town gas	10d. to 18d.
Motor spirit	20d. to 25d.

These figures are in themselves a measure of the value of the higher availability of special fuels. It may be said then that the fuel problem resolves itself into that of raising the availability of fuel at the least possible cost.

Having thus defined the problem, the author proceeded to review some of the work done in this direction during the past few years. He discussed recent investigations regarding the constitution of coal, and then touched upon the question of coal and peat supplies. This brought him to the subject of high-temperature carbonization in gas-works.

HIGH-TEMPERATURE CARBONIZATION IN GAS-WORKS.

The present tendency in gas-works practice, he said, is to obtain a greater number of the potential therms of the coal in the form of gas, which was made possible by the Gas Regulation Act of 1920. Early in 1917, the Fuel Research Board were requested by the Board of Trade to consider the whole question of gas standards, and to advise as to the most suitable composition and quality of gas and the minimum pressure at which it should generally be supplied, having regard to the desirability of economy in the use of coal and the adequate recovery of bye-products, and the purposes for which gas is now used. The most far-reaching of their recommendations involved the payment by consumers for the number of thermal units actually received, instead of the number of cubic feet of gas passing through the meter. It was left entirely to the discretion of the gas undertakings to decide in each case what the declared calorific value of the gas should be, though, this value having been once declared, a penalty is enacted should the gas examiners find at any time that the quality is lower than this to the extent of 5 p.ct. Having obtained this degree of freedom, great activity is being displayed in the investigation of processes which, prior to the passing of the Act of 1920, could not in any circumstances have been used for town's supply. That there is great scope for development may be gauged by the fact that, in the present practice, only some 20 to 25 p.ct. of the potential thermal value of the coal is obtained and sold in the form of gas. Most of the remainder is left in the coke, the accumulation of which is at times a source of considerable embarrassment to the gas engineer. Investigations are now proceeding actively in various quarters dealing with the more complete carbonization of coal; and work is also in progress upon the possibilities of complete gasification of the fuel.

STEAMING IN VERTICAL RETORTS.

Perhaps one of the most immediately useful developments in this connection, and one which in a number of cases can be effected with little trouble, is that of steaming the charge in vertical retorts. It is well known that, if steam is passed over red-hot coke, a reaction takes place, resulting in the giving-off of a gas containing hydrogen and carbon monoxide in equal proportions by volume, provided the reaction is complete. This process forms the basis of water-gas manufacture, and also enters partially into the generation of producer gas in suction and pressure producers. In the same way, if steam is passed into a heated retort containing coal, water gas is made and given off along with the coal gas obtained by the ordinary distillation. The total volume of gas obtained is considerably increased; but the calorific value is lowered, though not proportionately, so that the number of therms obtained in the form of gas is markedly increased. The work of the Gas Investigation Committee of the Institution of Gas Engineers and that of the Fuel Research Board shows that considerably increased therms in the form of gas, in tar, and in the

liquor are to be obtained by this method. The coke is less in quantity; but since this is the product which commands the lowest price, the net result is a considerable raising in the availability of the fuel.

The experiments carried out for the Gas Investigation Committee at the Uddingston Gas-Works were made on a type of Scottish coal known as the Lanarkshire Main and Ell. Those of the Fuel Research Board, working with their setting of four Glover-West retorts, were carried out on a Durham coal, a Yorkshire gas-coal, and also, for purposes of comparison, on the same type of coal as was used at Uddingston. At the request of a group of gas companies in the North, the Fuel Research Board have now begun a further series of experiments on a well-known Lancashire coal largely used for gas making. Much experimental work on this subject remains to be done—such as the investigation of the effects of temperature, rate of drawing, &c.—and it is hoped that in time the Board will be able to supply exact data on these points, as well as on other types of coal.

Dr. Lander showed a standard setting of Glover-West retorts fired by producer gas, as installed in a modern gas-works, and remarked that no producers are incorporated in the Fuel Research Station setting, since the heating is effected by water gas supplied from separate holders. The advantage of this method for experimental work lies in the fact that the amount of fuel gas supplied can be metered with accuracy, and accurate measurements secured of the heat supplied to the setting. Another departure from standard practice is the provision of a steel recuperator at the top of the setting. The waste flue-gases are passed over a nest of tubes through which the air for combustion is drawn. In this manner pre-heating of the air is effected by the waste heat of the spent gas. In all other respects the setting at the Fuel Research Station follows the accepted practice of the Glover-West Company. All material and products are weighed or metered into and out of the setting, so enabling weight-balances to be obtained to an accuracy of about 1 p.ct.

In all the coals tested at the Fuel Research Station, an increased yield of therms in the gas was obtained at a decreased expenditure of heat, with the use of 5 p.ct. of steam, as compared with the yield obtained when no steam is supplied. The explanation lies in the fact that heat is abstracted from the hot coke at the bottom of the retort, owing to the action of the steam which is converted into water gas. The coke therefore leaves the retort at a much lower temperature when steaming is adopted; and there is usually no necessity for quenching. Sir George Beilby, from his long experience in steaming charges of shale in the Scottish shale oil industry, as well as from the results obtained at the Fuel Research Station, is of opinion that vertical retorts should never be worked with less than 5 p.ct. of steam; and this has been adopted as the datum line for all future experiments at the station.

Low-Temperature Carbonization.

Much attention is at present being directed to the carbonization of coal at low temperatures, with the primary object of producing a solid smokeless fuel which shall take the place of coal for domestic purposes. If the whole of the coal at present used for domestic purposes were subjected to carbonization at low temperature, the advantages derived would include the conservation of the valuable oil products, thus rendering this country self-supporting to some extent in the matter of fuel-oil supplies. The general use of smokeless solid fuel would to a great extent solve the problem of the production of a clear atmosphere in our large towns, though it would not of necessity obviate the damage due to dust and sulphur given off by the products of combustion.

It is here necessary to lay stress upon the wide difference between the solution, on the one hand, of some local problem of carbonizing at a low temperature materials which are of the nature of waste products, commanding only a low price on the market, and, on the other hand, the design and production of an apparatus which would solve the national problem by showing a profit when working on a material such as domestic coal. The latter is infinitely more difficult of solution than the former, since the raw material of the process forms the principal competitor of the finished product, and the margin for working is necessarily small. In other words, if by starting with a slack costing from 10s. to 13s. per ton, a material can be produced which will command a price of 35s. to 40s. per ton, an apparatus can be used which would have no chance whatever if it were necessary to start with lump coal at a price little if at all short of that commanded by the resultant low-temperature fuel.

As an illustration of this, he referred to a well-known system of low-temperature carbonization which has met with considerable success in the United States of America. In the district where this process is being developed, the smoke laws render it impossible to find a market for bituminous coal; and anthracite commanding high prices is invariably used for domestic purposes. Some figures in his possession give the price of bituminous coal as three to four dollars per ton, and of anthracite as nine to twelve dollars. In this connection, several plants are in existence showing a profit which would vanish were any attempt made to use the system in the solution of our national problem. It may be said with confidence, however, that considerable progress has been made towards this end; and, in view of the large number of firms and individual investigators engaged upon the question, its elucidation may quite well be within measurable distance.

The files of the Patent Office testify to the numerous ways in which inventors have approached the subject of low-temperature carbonization; but it will be found that most of the ideas there presented will group themselves into a limited number of classes. One broad classification might be taken, as to whether the heat is applied externally to some type of fireclay or metal retort, as in the gas or shale oil industry, or whether an attempt is made to carry heat directly to the material under carbonization by means of hot gases, vapours, or liquids.

The Fuel Research Board have always recognized the necessity for obtaining reliable fundamental data on the methods of treatment of various types of coal, the yields of product obtained, and the heat expended in the process. For the past two-and-a-half years, therefore, the Board have been working with a bench of horizontal steel retorts, charged and discharged by hand labour. The size of each retort is such as to allow two shallow trays of broken coal to be inserted and left for the period of carbonization. The retorts are heated by water gas, which is allowed to burn quietly in a large combustion chamber completely encircling the retorts, except in front, where charging and discharging take place. The low-temperature gases are taken out by pipes at the rear end of each retort, and are then passed through a complete condensing and exhausting system. The coal is first broken-down roughly by the use of a disintegrator with one set of bars running. It was found at an early stage in the experiments that the apparatus did not lend itself to the production of a satisfactory coke from the more highly fusible coals. Experiments using mixtures of dry and fusible coals in almost equal proportions have, however, been completely successful in the production of a satisfactory low-temperature fuel.

Samples were shown of the product obtained, which is in the shape of cakes about 3 in. square, formed by dividing the trays into compartments by longitudinal and cross metal partitions half checked into each other. The presence of these partitions greatly facilitates the flow of heat into the interior, and so reduces the time required for carbonization, which is effected in from two to three hours. A number of experiments on different coal mixtures has been made. A curve showed the rate of gas evolution at various periods subsequent to the insertion of the tray into the oven. At first little gas is developed; but as carbonization proceeds, the rate increases to a maximum, after which the gas make falls rapidly. The practice at the Fuel Research Station is to withdraw the charge after the giving-off of an amount of gas corresponding to 3000 c.ft. per ton. Little is to be gained by continuing the carbonization process beyond this stage. Curves exhibited, he said typified practically the whole of the mixtures experimented upon, and directly refuted some of the often-quoted laboratory results, which state that, at 600° C., a total amount of 7000 c.ft. of rich gas may be expected.

At the Fuel Research Station a method of assay has been worked out from which it is possible to deduce with considerable accuracy the products to be expected upon the large scale from carbonization of any material. The apparatus consists of a miniature retort of silica, which can be heated under perfect control. A sample of 25 grammes of coal ground to pass a 60 mesh is used; and the liquid and gaseous products are accurately measured. From the laboratory apparatus the quality of the resultant coke can also be judged. Typical yields from suitable mixtures of coal carbonized at the Fuel Research Station are:

Coke	14 cwt. per ton
Oils	15 gallons per ton
Gas	3000 c.ft. ,,
Liquor	24 gallons ,,
Ammonium sulphate	6 lbs. ,,

No trouble whatever has been experienced with the working of these retorts. After having been under heat for two years, they are now in just as good condition as when they were first installed. The labour cost per ton is high, however, and the ground space large per unit of output. It follows, therefore, that, though this type of retort might possibly prove a commercial success in countries where a large margin exists between the cost of the raw material and that of the finished product, and where land and labour are cheap, it would certainly never prove a paying unit in Great Britain.

Some notes followed upon the "Carbocoal" low-temperature process, the Barnsley retorts, the Del Monte system, the Maclaurin retort, the Nielsen retort, and the Sutcliffe-Speakman process; and the lecturer concluded with sections on steam raising, the use of pulverized fuel, and domestic heating.

Domestic Heating.

Dealing with the last-named subject, Dr. Lander said that the question of the relative claims of gas against coal for domestic purposes is very controversial. For the direct heating of rooms, coal is undoubtedly cheaper than gas when it is desired to maintain the heat over long periods. When heat is only required for short periods, however, the claims of the gas-fire become much greater. The gas-fire has, of course, all the advantages of convenience and cleanliness. Electricity for heating suffers from the disadvantage, as compared with open fires or gas, that heat has first to be converted into work; and in the process some 80 p.ct. of the potential therms of the coal are thrown away in the condensing water. It must, however, be borne in mind that electricity forms a means for the convenient application of heat to some desired spot, and therefore in use can be applied with great efficiency. The claims of gas against electricity form a striking example of the problem mentioned at the beginning of the lecture—the stage in the process of the raising of fuel availability at which it would be most desirable to throw away the heat which must inevitably be lost before such heat can be obtained of the exact form and quantity, and in the exact spot, required.

APPLIED CHEMISTRY IN FRANCE.

The First Annual Congress and Exhibition.

The last number of our French contemporary, the Journal des Usines à Gaz, contains a short report on, and abstracts of certain papers presented at, the first of a series of annual meetings and exhibitions in the interests of industrial chemistry. It is said to have met with an unprecedented success, as testified not only by the attendance of large numbers of all classes of engineers and chemists, but by leading articles in all the big "dailies." This widespread interest our friends attribute to the war, which brought home to all the potentiality of chemistry—synthetic ammonia propped-up Germany through two long ghastly years in face of the blockade, while the infernal products of the Badische Fabrik and Grieshiem checked our soldiers in the line.

Scientific Research.

M. Georges Claude, in opening on the above subject, claimed that at this hour of reconstruction after five years of destruction one must build upon Science or be swept away. It was not enough to follow the lead of others; they must themselves strive to show the way. Monetary assistance for research work should come readily from the big industrial organizations, whose very life depended on it; while the Government should remember what research is doing for the *Défence Nationale*—the future battles and supremacy of the air could only be worked-out in the laboratory and the drawing-office.

It was not, however, sufficient merely to find the necessary financial support. An army of supporters for the future must be collected and trained, and instructed in the innumerable branches of possibility. Only by scientific research could time-worn industries be given new life, and young ones built-up on proper foundations.

Synthesis of Ammonia.

Of great interest, coming from such a master as M. Claude, were his remarks on the synthetic process of ammonia manufacture. The combination of elementary hydrogen and nitrogen was difficult to effect, although the reaction was exothermic. To it, however, Germany owed her power to hold out so long in the war, hard pressed as she was by the blockade. In 1904 there were but traces of ammonia produced synthetically, whereas tons were manufactured in 1914; ten years sufficing for patient study to commercialize the process by means of catalysis and high pressure. The best practice was found experimentally to be at 550° C. and 200 atmospheres. The output of Oppau—built for the purpose by the Badische Anilin—was 75,000 tonnes of combined nitrogen in 1917 and 100,000 tonnes in 1918; and even after her defeat, Germany reckoned on this chemical reaction to maintain her leadership over the world in the realm of synthetic chemistry, nitrogen the fertilizer being half-way towards nitrogen the explosive.

The Claude Process.

The Badische Anilin ammonia process had proved its worth, but it had one great drawback—it could function economically only in enormous units, excessively costly and vulnerable. By the Claude process, on the contrary, the output could be spread over many complete little units of 5 tonnes a day capacity. The author had profited by remarking that the higher the pressure the greater the output, and had decided to work at 1000 instead of at 200 atmospheres; the percentage of combining gas being immediately more than trebled. Only 3·3 H.P. per kilogramme of ammonia were requisite as against 2·4 H.P. by the Haber process—a low price to pay for extensive simplification. The Oppau disaster, fresh in the memory of all, proved how vulnerable were the colossal Badische factories; whereas the incidence of a similar catastrophe to a 5-tonne unit (in spite of the special precautions taken in their design) would involve but trifling expense. These small plants could be duplicated at will, lent themselves to construction on any site, and could be called upon to succour the arts of peace or augment the noise of war.

Utilization of Coke-Oven Gas.

In opening an interesting discussion on the above subject, M. Paul Mallet maintained that the most rational procedure would be to substitute the excess gas from coke-ovens for present town-gas supply. Gas-works might profitably increase their yield by stretching-out their processes of distillation; while apart from the material benefit derived, he considered it incumbent on them to scrub for benzole.

The primary product of coke-ovens being metallurgical coke as hard and as clean as possible, the quality and quantity of the excess gas produced was bound to be of secondary importance, and the coke-oven industry had no use for being tied-down in the matter of calorific power. This, however, was the case. The *Ministre de l'Intérieur* had proposed to fix the upper limit of town gas at 4500 calories per cub.m. (506 B.Th U.), and the Chamber of Deputies had raised that figure to 4750 calories (534 B.Th.U.) with insufficient reason; for the former heating value was already too high for the convenience of coke-oven working. In many cases municipalities might declare a figure which would preclude their purchasing gas from neighbouring coke-ovens; while already the coke-oven practice of only selling the better part of their output entailed heavy installation costs and complicated working with duplicated plant.

It seemed to the author that they should work on the lines he advocated, and should settle some standard range of calorific power suitable for coke-oven practice. Of course, price would vary with thermal efficiency, and the public would be further protected by the disadvantages incurred by distributing large quantities of inferior gas. He was confident that a general lowering of the present standard would result in a wider development of the coke-oven industry, and thought the hasty decision of the Chamber should be revoked.

M. Laurain was afterwards called upon, and stated that he saw eye to eye with M. Mallet—except for one important point. He agreed that gas making should be concentrated in large stations, whose only limit was one of distribution and which would tend to the lowest price per cubic metre of output. Regarding the previous speaker's suggestions, nothing was more natural than utilizing in whole or in part the gas output of a coke-oven battery for town purposes, provided there existed a sure outlet for its metallurgical coke; but it was an entirely different thing to suggest replacing ordinary town-gas practice with coke-ovens in a situation that allowed no really economic outlet for the coking engineer's special primary product. Their objects and consequently their processes differed too widely to allow any intermediate to serve the two purposes; and nowadays the gas industry possessed the additional advantage of being able itself to consume a proportion of its coke in manufacturing water gas. In choosing between the two systems, one had to take into account not only coal distillation, but the geographical factor as affecting transport charges.

In order to produce 1000 cub.m. of gas under statutory conditions, a gas-works distilled (on the basis of 300 cub.m. per tonne) 3300 kg. of gas coal, and got 1650 kg. of coke remaining for sale. For the same quantity of gas, coke-ovens had to treat (reckoning 280 cub.m. per tonne, of which 50 p.ct. was consumed for heating the battery) 7100 kg. of coal, 63 p.ct., (*i.e.*, 4450 kg.) of hard coke being available for sale. So that a gas engineer who sought to adapt his working on the lines suggested by M. Mallet would have more than to double his works' capacity to obtain his usual gas output and three times as much coke.

He agreed on the utility of concentrating gas making in large central stations, and of supplementing town-gas supply with the coke-ovens' excess production at a calorific power somewhere below 4500 calories (505 B.Th.U.); but he was resolutely opposed to the systematic substitution of coke-oven procedure for carbonization as carried out by gas-works proper.

Low-Temperature Carbonization.

In opening a brief discussion, M. Berthelot referred to the boost given by the war to low-temperature carbonization, the advantages of liquid over solid fuel having been brought well to the fore. He referred to the interesting research carried out in England on the production of coalite—interesting from a scientific point of view, even though not financially a success. As far as France was concerned, he thought her aim should, rather than the low-temperature carbonization of coal, be the production of metallurgical coke. By this means she could increase her independence.

Lignite.

The carbonization of lignite at low temperatures was, however, a different matter, and an undeveloped potentiality of the South-East of France. There existed three methods of procedure: Externally heated fixed retorts, with or without mechanical agitators; continuously acting rotating retorts; and gasification in special producers, a gas coming off of some 2800 calories (314 B.Th.U.). The latter process was favoured by the author, who observed that the lignite should be dried by the waste heat and that the apparatus should be designed to avoid the drawing-off of dust mixed with the tar produced. He instanced the Smith process, in which coal is distilled at 600° C., the resultant coke being briquetted and immediately redistilled at a high temperature in special retorts. The low-temperature carbonization gives per tonne 140 cub.m. of 5800 calories (651 B.Th.U.), and the subsequent gasification 115 cub.m. of 3600 (404 B.Th.U.).

M. Guillet, a well-known gas engineer, drew attention to the care necessary in dealing with lignites owing to the very high sulphur content of many of them. It was often entirely uneconomic to purify the gases of carbonization and the bye-products.

Winning and Utilization of Peat.—A handbook on the winning and utilization of peat has been published by H.M. Stationery Office, at the price of 30s. (by post, 31s.), for the Department of Scientific and Industrial Research. It is a translation from the German, arranged for by the Department at the suggestion of their Irish Peat Inquiry Committee.

Wills.—Among wills proved is that of Mr. Edward T. Wright, of Messrs. Westwood and Wright's, Chairman of the Brierley Hill and District Gas Company, and a Director of the Dudley Gas Light Company, who left estate of the gross value of £82,387. Mr. James Oakes, J.P., who was Chairman of the Riddings District Gas Company, has left £198,689. Mr. Archibald Dougall, who was for many years Manager of the Kidderminster Gas Company, and who died suddenly last December, left estate of the gross value of £6504.

TESTING OILS FOR BENZOLE AND NAPHTHALENE WASHING.

[F. Pannertz in "Das Gas- und Wasserfach," Feb. 25, 1922.]

Introducing his subject, the author points out the necessity of carefully investigating the suitability of oils which are offered for the extraction of benzole from gas. Many of them have been found to contain so much naphthalene that, however capable they may appear of absorbing benzole, they saturate the gas with naphthalene, instead of freeing it from this trouble. The author states that he has been at pains to devise simple methods of testing, which require no great skill or chemical knowledge in those who work them.

Capacity for Benzole Absorption.

For this test, a slow stream of air is drawn through a vessel containing crude benzole, and then through another containing a quantity of the oil which is to be tested. The air will then take up benzole, part of which will be absorbed by the oil in the second flask. If both the flasks and their contents are weighed before and after the experiment, it will be seen how much the benzole has lost in weight, and how much the oil has gained—in other words, what percentage of the total benzole vapour carried by the air has been absorbed by the washing oil. It is pointed out that the passage of the air will cool the benzole, and the oil will become perceptibly warmer. But the temperatures should be maintained as even as possible, by standing both flasks in a basin of flowing water. The quantities suggested for use are 50 c.c. of benzole and 70 c.c. of the oil, with 50 litres [about 1·8 c.ft.] of air, which should take an hour to pass. Examples are given of three oils which took up 76, 77, and 67 p.ct. respectively of the benzole vapour from the air current. By separate experiments it was found that two of the oils contained certain light fractions which vaporized when the air was passed through; but the quantities were insufficient to affect the main test materially.

Behaviour towards Naphthalene.

As mentioned above, it is necessary to test the oil for its initial naphthalene content, and also its capacity for extracting naphthalene from gas. For the former, the oil can be submitted first to fractional distillation. This does not, however, give a clear idea as to whether the oil is suitable for washing, so that, after testing it for benzole extraction, the author recommends the following procedure. If the fractional distillation shows considerable naphthalene, air is drawn as before, first through the oil, then through dilute sulphuric acid, and then through a solution of picric acid in distilled water saturated at 15° C. If there is a considerable precipitation of naphthalene picrate in the picric acid solution, it may be taken that the oil is unsuitable for gas washing. If the naphthalene from the fractional distillation is found to be of small quantity, the test can be made differently. Coal gas is drawn through two high cylinders filled with naphthalene, with which it thus becomes fairly saturated. It then passes successively through the oil, dilute sulphuric acid, and finally the saturated picric acid solution. If the oil will be suitable for naphthalene extraction from the gas, the naphthalene picrate precipitate in the picric acid solution will be barely perceptible. Otherwise it will be considerable, and will be observed shortly after the gas begins to pass. The experiment can be carried out quantitatively by titrating the picric acid solution with caustic soda after passing a measured quantity of gas through a known quantity of the picric acid.

Watching the Working in Practice.

Constant supervision of working results during gas making is necessary, and the author next describes a method of testing the gas for naphthalene before and after the washers. The following solutions are needed: Chemically pure picric acid, 10 grammes in one litre of distilled water; picric acid solution in distilled water, saturated at 15° C.; caustic soda, 170 c.c. normal solution diluted to one litre; sulphuric acid (1·840) diluted 1 : 10; and sodium alizarine sulphonate, one gramme in 100 c.c. distilled water as indicator. It is pointed out that, in the following test on gas before and after the washers, sulphuretted hydrogen and cyanogen must first be eliminated, and the reagents used for this will also remove the carbon dioxide. On account of the resulting necessary corrections in the gas volume, the test will probably have to be left to an expert chemist.

The procedure is to draw 100 litres [1 litre = 0·03531 c.ft.] of gas, at the rate of 40 or 50 litres in an hour, first through an absorption cylinder containing about 20 c.c. of dilute sulphuric acid, and then through two cylinders containing between them exactly 100 c.c. of the concentrated picric acid solution, the first having about 80 c.c., and the other the remainder. The three cylinders are intimately connected by means of rubber tubing. Generally, if the gas stream is gentle, the whole of the naphthalene picrate precipitate will be in the first picric acid cylinder, the second being quite clear. After the passage of all the gas, the apparatus is disconnected, and the two picric acid solutions thoroughly mixed. The naphthalene picrate settles very quickly, so that 50 c.c. of the clear solution, corresponding to 50 litres of gas, can be drawn off with a pipette for titration. The author considers this gives greater accuracy than filtering, as he finds the filter paper retains far too much picric acid. The caustic soda is titrated against exactly 50 c.c. of the 10 : 1000 picric acid solution, then 50 c.c. of the saturated solution, and finally a like quantity of the solution through which the gas has passed. Using sodium alizarine-sulphonate as indicator, the titration is from clear yellow to faint reddish yellow.

As an example of the method of calculation, 50 c.c. of the 10 : 1000 picric acid solution, corresponding to 0·5 gramme of $C_6H_3N_3O_7 = 0·2795$ gramme of $C_{10}H_8$, take 33·24 c.c. caustic soda, according to which 1000 c.c. of the latter = 8·4 grammes $C_{10}H_8$. The 50 c.c. of the saturated solution need 40·70 c.c. of caustic soda, and 50 c.c. (equivalent to 50 litres of gas) of the solution after passage of the gas take 40·61 c.c. Then

$$40·70 - 40·61 = 0·09$$
$$\text{and } 0·09 \times 2 \times 8·4 = 1·512$$

i.e., 100 cub.m. contain 1·5 grammes of naphthalene.

Washing with Mineral Oil.

Referring to the complete unsuitability of some oils which are offered for sale for gas washing, the author says that it occurred to him some years ago to test the mineral oils which are generally used for carburetting water gas. He had already ascertained that ordinary lighting paraffin works very well for naphthalene extraction. It was found that a carburetting oil, specific gravity 0·8815 at 15° C., with fractional distillation beginning at 100° C., and 53·2 p.ct. up to 300° C., completely freed naphthalene-saturated gas when 100 litres were passed through 20 c.c. of the oil. On his recommendation, a certain gas-works used such an oil for this purpose for many years instead of the usual anthracene oil, and found that the same oil, naphthalene contents and all, served excellently for carburetting water gas. Further trials, according to the method described at the beginning of this article, showed that a similar oil absorbed nearly 80 p.ct. of benzole passing through it, which together with other experiments in the same direction, proved that such oils are also quite suitable for benzole extraction.

A Combined Benzole and Naphthalene Test.

For the continuous supervision of benzole washing, and the testing of intermediate and final products as to the fitness of the oil for further use, a combination can be used of the apparatus already described. In this way, the capacity of the oil for further benzole absorption, and its naphthalene contents, can be determined at the same time. Draw 100 litres of air successively through 50 c.c. of crude benzole, 70 c.c. of the oil, 20 c.c. of dilute sulphuric acid, 100 c.c. of saturated picric acid solution, and finally through the experimental gas-meter. The loss in weight of benzole, and the gain in the oil cylinder, show the capacity of the oil for benzole extraction, and the picric acid shows whether the oil gives up too much naphthalene. The one objection to this combination, says the author, is that the naphthalene picrate is lighter owing to the traces of benzole vapour carried forward by the air current, and is apt to collect on the surface instead of settling. Practice will soon enable one to judge by appearances whether too much naphthalene is given up by the oil. Should, however, a quantitative test be required, a pipette, closed at the top, can be passed through the floating picrate, filled with liquid, and any traces of picrate clinging to the exterior wiped off before letting out the liquid. This will give more accurate results than filtration.

A NEW REGULATING AND STOP VALVE.

A new special regulating and stop valve, known as the "Vereg (Vee-Reg), and for which patent rights have been applied, is being put on the market by the Vereg Company, of Craven House, Kingsway, London, W.C. The valve has a regulating action giving very delicate control of the steam or fluid passing through it. This is obtained by means of triangular or any other known shaped notches in a special guide part of the valve, the steam or fluid penetrating through the apertures created as the valve is raised. The arrangement of the notches and the "lift" of the valve are such that a very fine regulation can be obtained. Further, until the valve is some distance from the seat, only a small quantity of steam or fluid can pass through the apertures and between the valve edge and the seat. Hence there is not the scope for "wire-cutting" that there is where the full force of the steam is pitted all round against the edge of the valve and the seat immediately many ordinary valves are raised off the seat. The reliability of the "Vereg" as a stop valve can therefore be understood.

The "Vereg" is very well made. Only the best quality materials are used throughout; the valve part and the seating being of an exceptionally tough special nickel alloy specifically invented for such work. Every part is made to gauge, and is renewable, and all valves are carefully tested prior to dispatch. It is suggested that the valve gives ideal service when employed on vertical retorts, horizontal retorts where steaming is adopted, water-gas plants, chemical plants, pumps, steam-jets of forced-draught furnaces, and in all cases where a fine regulation is desired or reliability as a stop valve is essential. When fitted to steam-engines, speed can more easily be regulated—a great advantage on steam-engine driven gas-exhausters, blowing plant, pumping, &c. The valve is suitable for steam, superheated steam, oil, water, and many other liquids, and can be supplied to take corrosive acids.

The manufacturers inform us that early reports from prominent engineers who have tried the valve are of a very laudatory nature; but they prefer the valve to "speak for itself."

TESTING AND CALIBRATING STATION METERS.

By F. R. PARSONS.

The purpose of this article is to enlighten those who at some time or other may be called upon to undertake the testing and calibrating of a gas station-meter—that piece of gas-works equipment which measures and records in cubic feet the gas made and passed into the mains for distribution and consumption.

Invariably a "wet" meter is employed for this purpose—that term being used in order to differentiate this class of meter from the ordinary "dry" meter. In the former the gas is measured in a drum, which carries a shaft supported in bearings at either end of a square, a rectangular, or a cylindrical case, partly filled with water. The measuring chamber proper is, therefore, that portion of the drum which comes above water level; its cubical capacity per revolution being indicated by the index mechanism which is fixed on the meter front. A cylindrical station-meter showing the index attachment referred to is shown in fig. 1. The automatic water level and overflow will also be

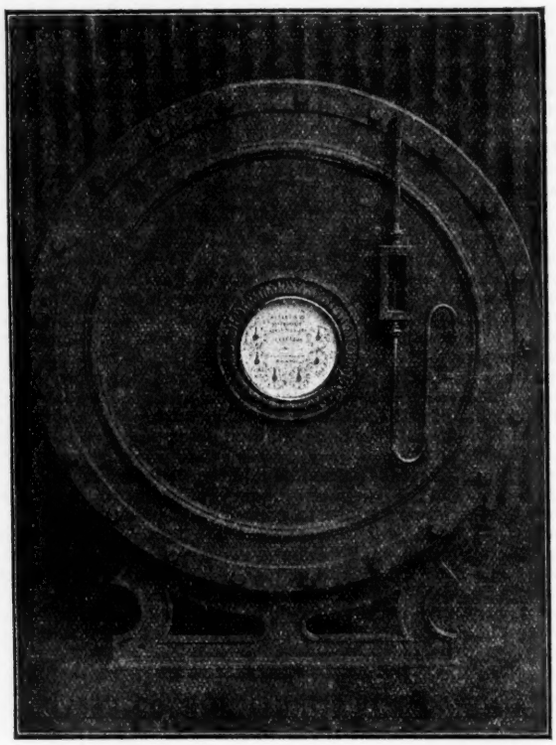


Fig. 1.—Cylindrical Station-Meter.

noticed in this illustration, details of which will be given in due course.

The measuring drum is divided longitudinally into four quarters or divisions, the partitions of which are set at an angle, thus offering a minimum of resistance to the passage of the drum through the water. There is also space through the centre of the drum for the free passage of water from one quarter to another, but there is not free passage for the gas through the drum, and out of the meter, until the drum revolves.

Gas is taken into it through an inlet spout, which enters the crown end of the drum, as shown in the sketch fig. 2, the top of the spout reaching above the level of the water in the case. The gas outlet from the drum is through the partitions at the opposite end, thus filling all that space above water level outside the drum, out of which it passes through the opening shown at the back end of the case in the same figure.

It must, therefore, be obvious that the essence of accurate measurement of a meter is the internal cubic capacity of that portion of the drum which is above water level; the latter being therefore the determining factor This being the case, it must equally follow that any interference with or deviation from an accurately ascertained level will bring about an error of measurement, which error will be repeated at the recording mechanism.

It is because there are so many factors militating against a continuity of accurate running conditions in a meter of this type that it becomes necessary at intervals to check its working against a standard test meter. The same thing applies when any repairs have been effected on the functional members of a station-meter, or the bearings have become so much worn as to allow the drum to drop lower into the water, or a new drum fitted, or it is desired to ascertain whether a drum is leaky—all these happenings necessitating a subsequent test for capacity and registration.

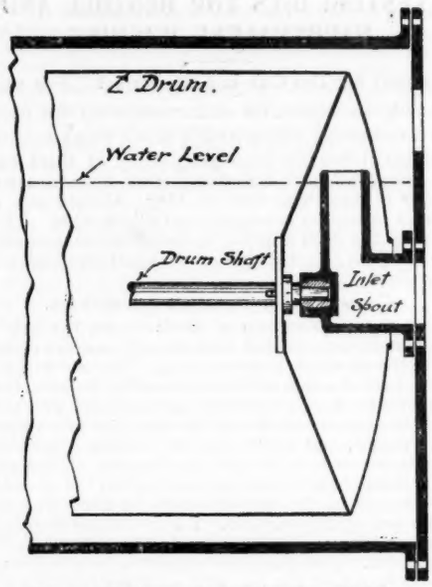


Fig. 2.—Diagrammatic Section through Meter.

TESTING APPARATUS.

Now we pass on to the operation of testing. The apparatus required for this purpose will have to be either a standard test holder (as illustrated in fig. 3), or a standard test meter, as shown in fig. 4. The test-holder consists of an inverted cylindrical bell floating in a tank of water, means being provided for raising or lowering this as desired, or adding pressure thereto by means of weights placed upon it. The bell is provided with a vertical scale; a fine pointer, viewed through a lens, being employed in conjunction therewith. The scale is finely graduated into parts of a cubic foot, so that, when this apparatus is employed to pass gas or air into a meter for the purpose of testing it, a very accu-

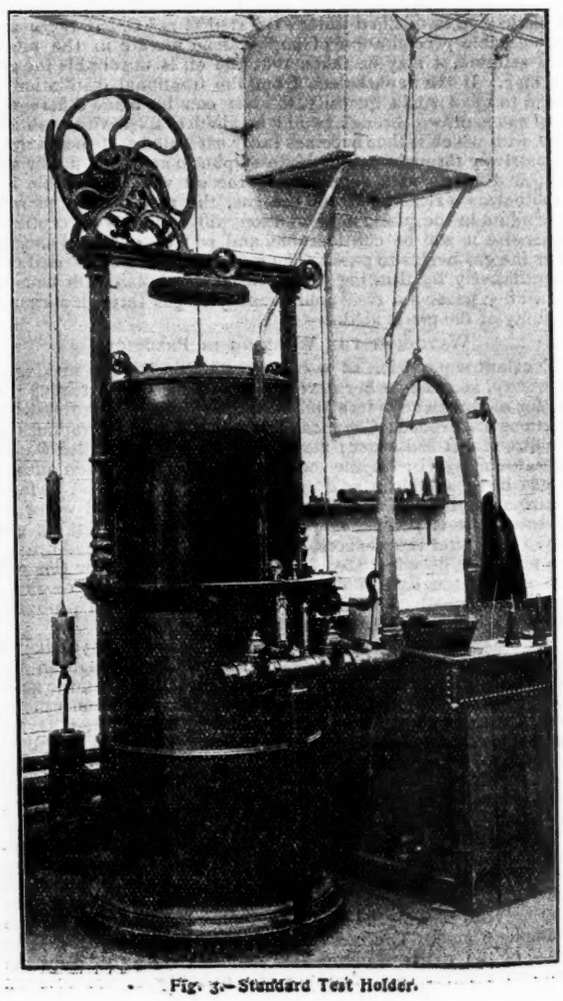


Fig. 3.—Standard Test Holder.

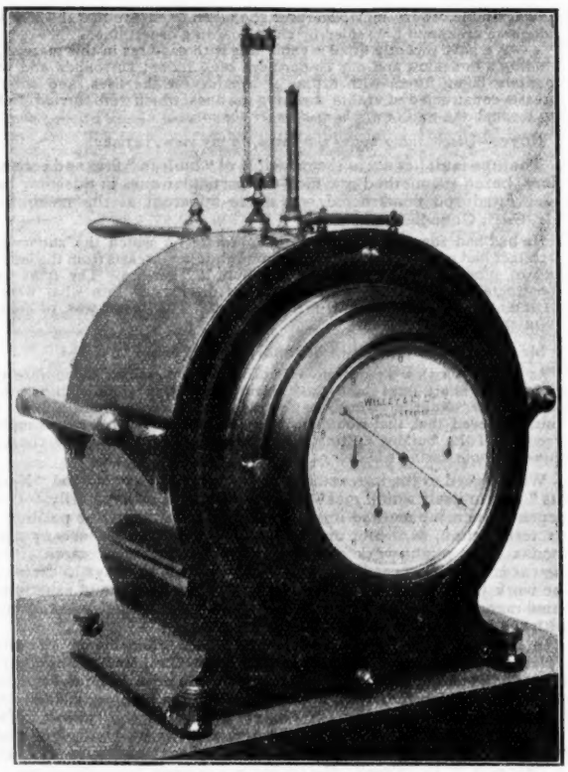


Fig. 4.—Standard Test Meter.

rate and exact reading can be obtained. A test-holder such as this is almost generally used in the Board of Trade gas-meter testing departments, and by officials connected with the gas-meter making industries.

When, however, it happens that a large station-meter requires to be tested *in situ*, it is usually the practice to employ a standard test meter. This is a wet meter of ordinary internal design, fitted with adjustable feet for levelling purposes, a double-direction spirit level, a water-column pressure-gauge, a thermometer, a visible water line, and, in addition to the usual dials recording tens, hundreds, and thousands, a large pointer indicating 0·01 part of a foot. This will have been tested, approved, and stamped by a competent official up to a definite output per minute; hence its reliability will be indisputable.

Connecting-up for Testing.

Assuming now we have our meter ready for testing, and it is desired to find the exact water level, in order that the drum shall contain a definite cubic quantity of gas per revolution. The illustration (fig. 5) represents a typical arrangement of connections for

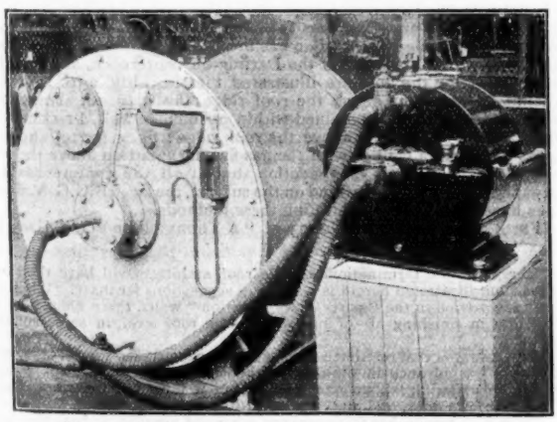


Fig. 5.—Connections for Testing a Station-Meter.

carrying out such a test. Gas from an independent source is led to the inlet of the test meter, while from the outlet of the latter a pipe is taken to the inlet of the station-meter, the outlet from the latter being through the wrought-iron bend screwed into the cast-iron flange—seen in the illustration at the back of the station-meter.

In testing a meter for its capacity per revolution, it will be found better to dispense with the index mechanism, and to the end of the drum spindle, or to the driving gear attached thereto, connect temporarily a long pointer, which will indicate at one revolution a similar revolution of the drum. Thus any faulty running of the latter, any jerkiness, or hesitation can be observed. At the same time a more exact record of such movement can be made than would be possible by means of the small pointer on the index mechanism, the lowest of which might not indicate less than 1000 c.ft. per revolution.

The first thing to do would be to test the general soundness of the station-meter—*i.e.*, the soundness of the portion above water level and outside the drum. To do this, plug the outlet, then open both inlet and outlet cocks on the test meter, thus filling both with gas. Now watch the long pointer on the test meter, and note if it moves ahead. If it does, then assuming all joints to be sound in the connections, there must be a leak in the meter. Soundness would be denoted by a stationary condition of this pointer, as also of the pointer on the test meter.

A sound condition being assured—and this is essential if absolute registration accuracy is desired—draw the plug in the outlet connection of the station meter, bring the pointer on the latter dead to some mark (which might be made either with chalk or a blacklead), bring also all pointers to zero on the test meter, then open both the outlet and the inlet cocks on the latter, and start gas flowing through both meters, checking down the inlet to the test meter until the stipulated quantity of gas per minute allowed for its capacity is passing. When the pointer on the test meter has made exactly one revolution—assuming this to be equivalent to one revolution of the drum—close the outlet cock on the test meter, and note carefully its reading.

Assuming the drum requires to be of (say) 100 c.ft. capacity per revolution, if the meter is correct, exactly this quantity should be indicated by the reading on the test meter. If, however, the latter records less than the station-meter, then the latter would be said to be "fast." If more, it would be termed "slow"' In other words, the first condition would imply that the gas space above the water line is too small; the second that it is too great. The obvious remedy then is either to raise or to lower the water line as required until the correct conditions are secured.

Modern-built station-meters are provided with an automatic water level. This consists of a small rectangular box of cast-iron, fixed either at the front or the back of a meter. It has a plate-glass front, and vertically in its bottom stands up an open-topped tube, the height of which corresponds with the water level within the meter case. Communication between the two is established by means of a hole situated towards the bottom of the box.

A syphon attached to the bottom end of the overflow tube and filled with water prevents gas from passing, since the upper portion of the box is filled with gas from a pipe connected to the inlet connection of the station meter.

Thus in testing a drum for capacity it is usual to leave this overflow tube sufficiently long, so that it may be cut-down to the height required. This height once established, it subsequently becomes impossible to fill the meter above this level, inasmuch as the water would overflow the top of the tube, and so escape down through the syphon.

Testing the Drum for Leaks.

When it is desired to test the body of a drum for leaks (which even in the case of one newly-constructed are liable to occur through a rivet, a joint, or by reason of defective soldering) proceed as follows. Attach the test meter as before, and again work from the pointer on the station meter; but in this case the outlet from the station-meter must be throttled-down until the orifice for the escape of gas is no larger than a fine knitting needle, or until the rate of gas passing the test meter is as low as from half to one cubic foot per minute.

Now watch the progress of the pointer on the station meter. If a leak does exist in any portion of the drum as it comes above water level, the latter will stop, since the small quantity of gas passing will escape through the leak without driving the drum. Thus each separate division can be tested and the whole of the drum checked thoroughly for soundness.

Influence of Temperature upon a Test.

Whenever such a test as described is being made, it must be remembered that as far as possible the temperature of the gas and the temperature of the water in the meters should correspond otherwise a difference in this respect will affect the results.

Thus 2° Fahr. will make a difference of ½ ft. per cent. in the reading. For example, suppose the gas as it leaves the station-meter outlet shows a temperature of 50° Fahr. and the gas entering the test meter reads as 48°, and the readings of the meters show 99·80 c.ft. on the test meter, with 100 c.ft. on the station-meter, then, as a matter of fact, 99·40 would be the actual reading of the station-meter.

Another point of interest to note is that in this connection the Sale of Gas Act allows that if a meter is found to be no more than 2 p.ct. fast, or 3 p.ct. slow, it may, with certain reservations chiefly to do with pressure, be regarded as coming within the requirements of the Act.

Joint Scottish Junior Association Meeting.—The annual joint visit of the Eastern and Western District sections of the Scottish Junior Gas Association will take place next Saturday, March 25, when the members will inspect the Provan Gas-Works, Glasgow A thoroughly enjoyable afternoon is anticipated.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas-Works Rating.

Sir,—I am pleased to find in the current issue of the "Journal" that my few remarks at Manchester on gas-works rating have induced you to give some consideration to this subject.

Of course, I did not expect that what I had to say would meet with general approval; and time would not permit me to enter more fully into the *pros* and *cons.* of the question. Permit me, however, to suggest that the poor old "Hypothetical" is a very decent chap, when properly treated; but had he been pitch-forked into the tenancy of many gas-works during the past few years, at a rent based upon the rateable values, he would, in all probability, have either gone under or would ere now be enjoying the hospitality of the Rating Authorities. What I wished particularly to emphasize was that, in my opinion, there is a great point in separating rates from taxes, especially from a municipal point of view; and very logical arguments, based upon experience, could be brought forward by many engineers in support of my contention.

Your statement that: "Some authorities have a preference for assessing on a higher basis than others in order to be able to charge a lower rate," is a fact, and entirely supports my contention; for in your previous paragraph you stated that the basis of gas-works assessment is more or less the rent, which I take it is derived from an adjustment of the profits. This is our foundation; only I am afraid many undertakings have not seen fit to build a proper superstructure thereon.

Gas-Works, Chesterfield, March 18, 1922. H. Davies.

Compressed Oil-Gas Hydrocarbon.

Sir,—An article on the above subject in the current issue of the "Journal" is interesting to me, inasmuch as I have had experience extending more or less over eighteen years with its use as a carburetting agent for coal gas. In the early part of my experiments the gas was allowed to take up the hydrocarbon vapours by simply passing over the surface of the liquid; but my subsequent practice was to subject the liquid to low-temperature steam, at the same time passing a flow of gas through the receptacle to carry forward to the main gas supply the hydrocarbon vapours thus formed, leaving about 10 p.ct. of a tarry liquid, which was periodically withdrawn, and which it was my practice to place in the hydraulic mains of the coal-gas plant.

I used this light hydrocarbon liquid with great advantage during the period when washing for toluole and benzole was essential for war purposes, and when naphthalene was causing much inconvenience in many districts. A large quantity of this liquid was, I believe, converted into a motor spirit by low-temperature steam distillation, during the restrictions upon petrol and benzole; and although from its use the resultant exhaust gases had not the pleasantest of odours, and perhaps its effect upon the internal parts of the engines was not so cleanly as may be experienced with petrol, still it served its purpose in many instances, and from my own experiments with the distillate, using a motor cycle, I can confirm this.

From the contribution which you have published it is evident that the liquid does not yield a good motor spirit without careful separation and washing; and its employment as a carburetting agent for gas is to-day somewhat at a discount. Still, its uses as a permanent enriching agent are good; and the investigators would do well to continue their research, as probably it may be found that the liquid will provide a ready and cheap means of adding thermal value to our gas, and at the same time enable some gas engineers, particularly on small works, to adjust the calorific value of their gas in accordance with the needs and the standard which they have chosen to adopt.

H. Davies.

Gas-Works, Chesterfield, March 18, 1922.

Mr. W. L. Westbrook's Paper on "Gas-Fires and their Ventilation, with Special Reference to Cavity Flues."

Sir,—As the "B.C.G.A." have been largely responsible for the advocacy of "Gas-Fire Economy Flues," the attention of Mr. H. H. Creasey, who first suggested their use, was called to the report of Mr. Westbrook's paper on the subject, and to your comments thereon; and the following memorandum received from him will, it is hoped, be of interest.

I have carefully read the above paper in the "Gas Journal" of March 1, and also the editorial in connection therewith. While I quite agree that care is necessary in dealing with "built-in" fires and economy flues, in my view there is no ground for alarm, as the principle the "B.C.G.A." have advocated is perfectly sound, and the trouble that Mr. Westbrook has met with has arisen solely because the rules that we have consistently set out have been broken, as instance the following points which I have extracted from his paper:

1.—Several builders in my Company's area have been constructing flues in the cavity spaces of exterior walls, and carrying them up a matter of 6 ft. or so, terminating with a ventilating brick.

2.—In the latter instances, the fires were fitted in angles, and the brickwork surrounds built out to accommodate the width of the fires, with the result that immediately above the fires there were considerable chambers with a double set-back in the brickwork leading to the cavity flues, which were of inadequate area and terminated at the ceiling level in ordinary ventilating gratings.

3.—On one important estate where special gas-flues have been constructed in the cavity spaces, the flues have been extended to terminate in the roof space; and the result has been on the whole very satisfactory. While a bad down-draught from a roof space is sometimes experienced, I consider it generally more satisfactory to terminate a flue there than to discharge directly into the open air, always provided a properly constructed flue is not available. Care must, however, be taken to ensure that the roof is of adequate area, and not sealed by close boarding or felt lined.

4.—We have recently fitted several huts with gas-fires in this manner, including a bungalow and our co-partners' club room; surrounds and overmantels being fitted, with art-metal backing for the fires, and chimney breasts constructed of uralite, covering the flues, which were carried straight up through the roof or *discharged under the eaves.*

Note.—Discharging under the eaves, in my view, is risky.

That the fault lies not in the principle of "built-in" fires and economy flues, but in the method in which the particular ones in question have been fitted and constructed, was made apparent at the meeting by Mr. S. B. Chandler, who said:

He had had something to do with an estate on which the supervising architect had agreed partially to eliminate chimney-breasts from the houses, and to substitute for the coal-fire a "built-in" gas-fire. The flues were constructed in the thickness of the wall and discharged into what were to all intents and purposes coal-fire chimneys. The result was, of course, quite satisfactory.

Mr. Westbrook himself in his final remarks said:

As to Mr. Winslow's point, he did not want the members to confuse this question of short flues with the "Nautilus" flue. If the builders had adopted the "Nautilus" flue, they would not have had this trouble. He quite believed that that would be all right. It was in his case simply a question of the builder cutting down costs, and putting in the cheapest thing, without caring whether or not it was effective.

With regard to the latter statement, I cannot agree that the "Nautilus" flue in itself would make the gas-fires work satisfactorily. It all depends upon the method in which the flue is run and the position of its termination, as, while discharging under the eaves or any unorthodox place might work satisfactorily in a number of cases, in my view it is a risky proceeding; and I should prefer always to carry out the work in a proper way, simply constructing the flue in exactly the same manner as a coal-fire flue, but reducing the size in conformity with the lessened area required by a gas-fire.

In order to show that we have always stated quite clearly the principles which should be followed in fitting the "built-in" gas-fires with economy flues, and that specific warnings have been given against the practices to which Mr. Westbrook refers, I quote below some extracts from papers and articles which I have written on the subject. The "Bulletin" of June, 1920, contained a report of the Darlington conference, at which I read a paper entitled "Gas Heating in Relation to Economy in Building." Following are extracts from this paper:

The ventilating shafts, to be constructed in the thickness of the walls, should be (say) 9 in. by 3 in. for gas-fires up to 10 in. wide fire-front, and 12 in. by 3 in. for larger sizes, or in each case slightly different dimensions could be provided either in width or depth. Some architects may leave out a brick in thicker walls, thus providing a shaft 9 in. by 4½ in. In any event, the smallest one I have quoted, 9 in. by 3 in., you will note, provides an area of 27 sq. in., leaving a good margin over—indeed, being double—the area of the 4 in. pipe = 13¾ sq. in. used in Dr. Owens' tests previously mentioned. The area of the ventilating shaft for the gas-fire could, therefore, be smaller than the size I have mentioned, if some alternative or additional method of ventilating the room is also provided.

The walls in which the shafts would be provided would usually be 9 in., or, when "partition" walls, 4½ in. thick. Sometimes they would be solid, in other cases cavity walls will be used in constructing the buildings.

The termination of the shafts should *not* usually be provided with cowls, which—as a general principle—would prove absolutely superfluous, unsightly, and a source of unnecessary expense.

If downdraughts occur, however, in individual and exceptional circumstances, some approved form of cowl could be suitably attached to the outlet on the roof.

Downdraughts will be few and far between, however, so long as the terminations of the flue outlets on the roof are at least as high as the highest portion of the building, and preferably slightly raised (say) some inches to a foot above this. Any departure from this general principle should receive careful and expert consideration.

Above the flue outlet of the gas-fire the shaft will commence, and will be carried (with the usual ramp, if and when needed) to the roof level.

"A Thousand-and-One Uses for Gas," No. 73, dated March, 1920, contains an article by myself on gas-fire flues. In this I quote many things to which I referred at the Darlington conference, and methods of constructing the flues are illustrated therein. Fig. 2 (p. 17) shows the flues terminating above the roof ridge; fig. 3 (p. 18) shows that, even when the flue is contained within an outside wall, I recommend its extension to a height above the roof ridge; fig. 4 (p. 19) shows a cross-section of a cottage with the gas-fire flues carried above the roof ridge. Incidentally, I may mention that at all the conferences and in papers which have been read on the subject, the large B.C.G.A. drawings have been shown illustrating these methods.

Further extracts from No. 73 of "A Thousand-and-One Uses for Gas" are as follows:

As regards the terminations on the roof, architects will have their own ideas; but illustrated herein is a series of suggestions for these. When the flues are carried in the "party" or "partition" walls, there should be no difficulty in finishing at—or just above—the roof level, in some suitable method.

Experts agree that restricted flues, suitably constructed for gas-fires, constitute a big advance in building methods, and offer a very appreciable saving in material, labour, and money; but it must be remembered that these flues are flues, and must be dealt with accordingly.

There is a danger that this excellent means of ventilating both the room and the gas-fire adequately, and, at the same time, economically, may be brought into disrepute with the building authorities by freak suggestions, such as ventilating the gas-fire into a cavity wall, in the hope that the products of combustion will be absorbed or find their own exit somewhere. This will not do; the flues must be properly designed and carried out in a thoroughly practical manner!

Another suggestion which should be discouraged is to terminate the flue in the roof cavity. If this is tolerated we should find the copper flue treated in a similar way, and in this case the products of combustion would be surcharged with a very high percentage of steam from boiling water, which would condense on the under side of the roof with very detrimental effects.

Reduced flues constructed for gas-fires should be strongly advocated, as they materially lessen the building costs of the proposed houses; but they should be constructed properly to discharge directly into the open air, as previously described.

"A Thousand and One Uses for Gas," No. 81, contains a paper which I read before The Society of Architects at the Building Trades Exhibition in April, 1920. Most of the points I have mentioned above were enumerated therein, and the drawings mentioned were shown. I also said there:

Each gas-fire should have its own separate and distinct shaft. There is a danger that this excellent means of ventilating both the room and the gas-fire adequately, and at the same time economically, may be brought into disrepute by carrying the theory too far. For instance, suggestions such as the following have been put to us. "Ventilating the gas-fire into a cavity wall with no flue constructed whatever in the hope that the products of combustion will be absorbed or find their own exit somewhere." This will not do; the flues should be properly designed and carried out in a thoroughly practical manner.

Another suggestion which should be discouraged is to terminate the flues with open ends in the roof cavity. If this were accepted, we should perhaps find the flue from the washing copper treated in a similar manner, and in this case the products of combustion would be surcharged with a high percentage of steam from boiling water, which would condense on the under side of the roof, with very detrimental effects.

As a further proof of the theory which we have put forward, I may quote the following extract from "Housing," the official publication of the Ministry of Health. In the edition dated June 21, 1920, the following appeared:

The Ministry have had under consideration the question of methods of construction of flues for gas-fires, and have discussed the matter with the British Commercial Gas Association. The Ministry consider that the following rules should generally be observed:

1.—The cavity of a hollow wall should not be used as a flue for gas-fires, unless a suitable shaft is properly constructed therein.

2.—If smoothly finished, the size of the flue for a gas-fire need not exceed 20 in. in area, but should be not less than 18 in. in area, nor less than 3 in. wide in its narrowest part.

3.—Al flues for gas-fires should discharge into the outer air at the top of the building, so that there may be no danger of back-draught into any room.

4.—Additional flues of about 20 in. in area might, with advantage, be provided as ventilating flues adjoining fire flues, with inlet openings near the ceiling.

Of course, the above details more especially referred to houses of the housing scheme type; but in an article which I wrote for "The Builder" in October, 1920, after quoting this extract from "Housing," I added the following paragraph:

In order that our readers shall not be misled, we must remark here that the flue areas above-mentioned refer to those intended for small rooms such as those found in housing schemes; larger rooms would, of course, need increased flue areas in proportion to the size of the requisite gas-fire and the cubic capacity of the room.

As a final proof of the efficiency of a correctly constructed "built-in" gas-fire flue, I would draw your attention to Mr. Clark's report of a test carried out by him at Acton.

The building economies which can be, and are being daily, effected in various parts of the kingdom, and the resulting business to the gas industry, are, in my opinion, so valuable that it would be a pity if the principle received a set-back owing to Mr. Westbrook's paper.

British Commercial Gas Association,
30, Grosvenor Gardens, Victoria,
S.W., March 20, 1922.

J. C. Walker, Secretary.

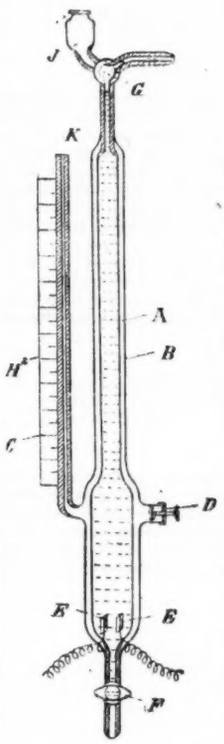
Primitiva Gas Affairs.—The following reference to the affairs of the Primitiva Gas Company of Buenos Ayres was made in the city notes of "The Times" last Thursday: Within the last few weeks a recovery from £2 to £3 has occurred in the 5 p.ct. cumulative preference shares of the Primitiva Gas Company of Buenos Ayres. The ostensible basis of the movement is the knowledge that six years' arrears of interest, or 30 p.ct., have accumulated on the shares, and that these arrears, which represent a sum of £750,000, will probably be funded sooner or later. On the position as it exists at present, however, there is no solid basis for a funding scheme, as the Company have yet to return to the stage when the revenues suffice to show a dividend on the preference capital. Last year, the accounts in respect of which may be expected shortly, the Company for the first time since the war were able to earn their fixed charges, thanks largely to cheaper coal; but it will probably be found that there was scarcely any surplus. Among the unfortunate results that followed from the war-time difficulties of maintaining the Company's gas service was the loss of many customers. The management are now engaged in active efforts to try to get back these lost customers, and with that object in view are conducting a house-to-house canvass.

Congleton Gas-Works Extension.—The Congleton Gas Committee have considered the report of Mr. W. Newbigging on the proposed extension of the gas-works at an estimated cost of £35,000. The Chairman (Alderman Jolly) said Mr. Newbigging was satisfied with and recommended the adoption of the Gas Manager's scheme. Mr. Salt asked if the Committee considered it wise to go in for such a large expenditure at the present time. The Chairman said they were compelled to do something, as the plant at the gas-works was absolutely at the limit of its manufacturing capacity. They were as close as possible to the point at which they would be short of gas. Mr. Lawton said their gas expert had reported on the present plant as being too small and inefficient; and this was sufficient to compel them to proceed with the extension. The Mayor (Ald. J. Maskery) remarked that some members seemed to discourage the scheme on the ground of their indebtedness; but against this there was the fact that, if they did not make some such extension, the gas supply would come to an end so far as meeting the adequate needs of the town was concerned. Mr. Jackson thought they were not justified in spending £35,000 at the present time on an obsolete works. It was eventually decided to adopt the scheme. The Chairman (Alderman Jolly) said the Gas Manager suggested that at the end of March the price should be reduced 9d. per 1000 c.ft. to ordinary and power consumers, and 3d. for slot-meters. The reduction was approved.

REGISTER OF PATENTS.

Apparatus for Determining the Heat Value of Gases.

No. 156,577.



"Union" (German) Apparatus for Heat-Value Determinations.

"Union" Apparatebaugesellschaft, m.b.h., of Karlsruhe.

No. 34,334; Dec. 4, 1920.
Convention date, Jan. 3, 1920.

This process, for the determination of the heat value of gases in an explosion burette provided at top and bottom with cocks and surrounded by a jacket, and having two electrodes extending into it, is based on the principle that the measurement and combustion of the standard gas and of the gas to be tested, as well as the generation of the hydrogen serving as the standard gas, is effected in one and the same chamber in the lower part of which the electrodes are situated. The amount of heat generated by the combustion is absorbed by the liquid having a great coefficient of expansion situated in the jacket, and its expansion is measured. Since the determinations are made under the same conditions of pressure, temperature, and water-vapour saturation, these factors are eliminated, and the upper limit of the calorific power of the dry gas, reduced to normal conditions, is obtained without further correction.

With reference to the appended drawing, the process is carried into effect in the following simple manner:

The burette A is filled through the cock F, by means of a level-tube, with acidulated water, and oxy-hydrogen gas is allowed to be formed. Then a determined quantity of it is measured off, and air is allowed to enter until the burette is quite free from water. Then the cocks are closed, the mixture is exploded, and the expansion-distance is read-off on the scale C. Then the burette is again filled; and the same quantity of test gas as was taken of hydrogen is measured off and mixed with air. After the explosion a reading is taken. Since the heat value of hydrogen is known—that is to say, is equal to 3050 heat units per cub.m.—the heat value of the test gas is obtained as

$$\frac{\text{Test gas expansion} \times 3050}{\text{Hydrogen expansion.}}$$

Carbonizing Carbonaceous Materials.—No. 174,676.

Wallace, G. W., of East St. Louis (Ill.).

No. 27,279; Sept. 24, 1920.

This invention relates to the carbonization or distillation of carbonaceous materials—more particularly the production of oil and coke from coal. A prior specification (No. 129,997) describes a process for distilling, carbonizing, or vaporizing carbonaceous materials such as coals, lignites, oils, and shales by heating carbonaceous material in a retort and removing the evolved gases and liquids before they undergo secondary decomposition. In using this process for the carbonization of coal, manufacture of coke, and production of oil from bituminous substances which fuse upon being subjected to a high temperature, however, in some instances gases continue to evolve from the material that has passed through the coking stage and produce a back-pressure in the outer zone lying beyond the coking zone. If this back-pressure becomes relatively high, the gases that are evolved in the outer zone are forced through the coking zone, thereby producing fissures or cracks in the fused mass in the coking zone. These fissures or cracks, when first formed, are very slight; but as the material continues to shrink as the coking operation proceeds, they open-up, thereby causing the coke that is produced by the process to be fragile and in the form of small pieces. Moreover, the back-pressure seems to increase the time required to carbonize or distil the material in the retort.

The main object of the present invention is to provide a process for distilling, carbonizing, or vaporizing solid carbonaceous materials that has the good features and characteristics of the process described in the prior patent—namely, prevents the evolved gases and liquids from undergoing secondary decomposition, and which ensures the production of a good grade of coke, when coal is the carbonaceous material distilled—even though gases are evolved in the zone outside of the coking zone. Another object is to provide a novel apparatus for the process.

To this end the gases and liquids are withdrawn under reduced pressure and travel through the coolest portion of the material into a take-off duct, through which they immediately escape from the apparatus. This prevents a back-pressure from being created of sufficient force to cause the gases in the outer zone to disrupt the fused material in the coking zone at the critical time in the process at which any disturbance will have a permanent effect on the structure of the coke. The apparatus consists of a closed chamber or retort, a perforated take-off duct arranged inside the chamber and connected at one end to

a suction-producing device, and a valved exit for the relatively small amount of gases that are evolved in the zone outside the coking zone.

[The closely-detailed description which follows is of great length and must be omitted. Ed. "G. J."]

Gas-Fittings for Ovens.—No. 174,876.

Flavel, P. W., of Leamington.

No. 8402; March 17, 1921.

This invention relates to improvements in gas-fittings for coal-ovens whereby the ovens can be heated by gas, and in which the oven dampers are combined with means for automatically controlling the gas supply so that the gas cannot be turned on when the dampers are closed. Although applicable for ordinary ranges, the invention is designed more particularly for the ovens of those convertible domestic fire-places and cooking stoves in which the oven is placed over the combustion chamber or fire-place, and in which the latter is combined with a hinged hot-plate.

Briefly stated, the invention comprises a gas-fitting of the above character in which an opening is arranged in the bottom of the oven and a corresponding air opening in the oven casing, and in which a slide-valve of box formation with open sides is arranged between the openings.

Gas-Fires.—No. 175,331.

Selas Turner Company, Ltd., of Coventry; and Turner, E., of Urmston.

No. 28,050; Oct. 4, 1920.

This invention has for its object to produce a gas-fire which will serve the dual purpose of heating and lighting. A fitting is provided on which are mounted one or more burners with incandescent mantles thereon in juxtaposition to a light transmitting and radiating surface composed of a transparent or semi-transparent material unaffected by heat or rapid heat changes, such as fused silica, preferably used in combination with a reflector at the rear.

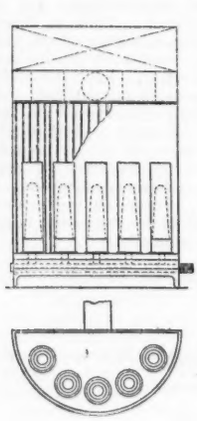


Fig. 1.

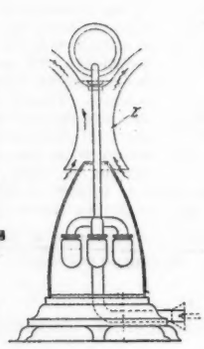


Fig. 2.

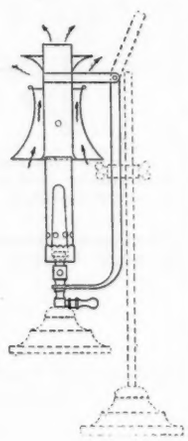


Fig. 3.

The fire comprises a base with an ornamented back and canopy; the hearth being formed crescent shaped and provided with a plurality of bunsen burners, say four in number, arranged parallel to the edge and over which are placed gas-mantles. Each burner is surrounded by a chimney of fused silica or enveloped by a silica cap which, when upright mantles are used, is perforated at the top. The semi-transparent variety is preferred, as the light rays are evenly diffused in their passage through it. Behind the burners a polished metal reflector is located. The arrangement is such that a gas fire is produced of highly efficient heat-radiating power and transmitting a soft, diffused light of great intensity. To obtain the maximum radiant heat, the hot gases may be circulated and discharged through metal tubes.

It will be obvious, the patentees say, that the means for obtaining the advantages may be varied without departing from the spirit of the invention. This they illustrate by fourteen diagrams, which include many different forms of the appliance. Only three can be included in this short abstract of the specification; fig. 1 showing an elevation and plan of a five-element lighting and heating stove. Fig. 2 is of a modified portable construction; and fig. 3 is described as "illustrating the invention in its simplest form."

Manufacture of Ammonium Sulphate.—No. 174,878.

South Metropolitan Gas Company, Evans, E. V., Parrish, P., and Weight, O. W.

No. 8515; March 18, 1921.

The neutralization of the acid crystals from the ordinary ammonium sulphate saturator by means of a dilute solution of ammonia fed to the centrifugal machine in which the crystals have been drained, is a satisfactory operation. There are certain cases, however, particularly in the production of ammonium sulphate at coke ovens by the so-called direct or semi-direct process, where the crystals produced in the saturator are too fine to permit of satisfactory treatment in a centrifugal machine. In these circumstances, recourse must be had to stirring the crystals with the ammonia solution. Since efficient stirring and subsequent settling require a considerable proportion of liquid to solid, a simple ammonia solution would dissolve too much of the sulphate for profitable application. A known method consists in using neutralized mother liquor—that is to say, a saturated neutral solution of ammonium sulphate—and in continuing the washing until the solution leaving the crystals is free from acid. By the stirring method, this means the use of a large volume of the mother liquor even if the latter is slightly alkaline with ammonia.

It has not hitherto been suggested that the mother liquor should be so far alkaline with ammonia that one application of it, by the stirring method, should suffice to produce a neutral sulphate; the reason being, no doubt, that such a treatment spoils the colour of the sulphate crystals.

The process of neutralizing the acid crystals from an ammonium sulphate saturator which forms the subject-matter of the present invention, consists in first making alkaline with ammonia, free from sulphuretted hydrogen, the mother liquor which drains from the crystals removed from the saturator—the proportion of ammonia being sufficient to neutralize the acid likely to be present in the drained crystals. This ammoniacal mother liquor is then treated with a suitable oxidizing agent—for instance, air—until no further precipitate is produced, whereupon it is filtered. These operations are conducted while the temperature of the liquid remains or is kept at that which it had when it left the crystals. The filtered, tepid, ammoniated mother liquor is now ready for mixing with the drained crystals by the stirring method, which allows of separation of remaining impurities by settling the crystals and decanting or otherwise removing the liquid containing the suspended impurities. This liquid may be returned to the saturator.

The settled salt may be centrifuged to drain it; it is then neutral and of good colour.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 15.]

Nos. 6491 to 7266

Adlam, T. N.—"Bye-pass valves." No. 6566.

August's Muffle Furnaces, Ltd.—"Valve control means for fluid-pressure mains." No. 7058.

Bartlett, E. E.—"Appliance for utilizing waste-heat of gas-rings, &c." No. 6929.

Bird, W.—"Anti-vibration suspension devices." No. 6555.

Brown, R.—"Fireclay, &c., gas-burners." No. 6971.

Clark, F. W.—"Process of manufacture of gas from coal, &c." No. 6931.

Coggon, H. F.—"Valve control means for fluid-pressure mains." No. 7058.

Dempster, Ltd, R. & J.—"Means for extracting coke from vertical retorts or chambers." No. 7087.

Docking, A.—"Rotating gas-heated cylinders for drying or roasting grain, &c." No. 6650.

Etna Lighting & Heating Company, Ltd.—"Lamp globes, shades, or deflectors." No. 6532.

Fox, T.—"Dry gas-meters." No. 6792.

Ganahl, C. F. de.—"Distillation of coal, shales, &c." No. 6886.

Greenwall, M.—"Means to prevent tampering with pipe-joints." No. 6876.

Haden, C. I. & W. N.—See Adlam, T. N. No. 6566.

Head, Wrightson, & Co., Ltd.—"Means for screening materials." No. 6573.

Helps, G.—"Gas-cookers." No. 7073.

Love, S. J.—"Improvements in lamps, &c., to reduce glare therefrom." No 7250.

Metcalfe, W.—"Upright incandescent gas-mantle holder." No. 6818.

Musgrove, C.—See Bartlett, E. E. No. 6929.

Robinson, J. W.—"Lead-pipe connector." No. 6902.

Robinson, S.—"Dry gas-meters." No. 6792.

Rodger, W. F.—See Dempster, Ltd., R. J. No. 7087

Sharp & Preston, Ltd.—See Docking, A. No. 6650.

Travers, M. W.—See Clark, F. W. No. 6931.

White, A.—"Incandescent gas-burners." No. 6632.

Wrightson, Sir T. G.—See Head, Wrightson, & Co., Ltd. No. 6573.

The Gas and Water Committee of the Goole Urban Council have decided, as from April 1, to reduce the price of gas 6d. per 1000 c.ft. The present price is 5s. 9d.

At a local auction last week, £500 of York Gas Company consolidated ordinary stock was sold at £57 12s. 6d. p.ct.; and £452 10s. of the same stock, at £57 17s. 6d. p.ct.

A private company, under the title of Walter H. Brown & Co., Ltd., has been registered, with a capital of £75,000, to carry on the business of dealers in tar, pitch, coal-tar products, &c.

The Beccles Water and Gas Company announce a further reduction of 6d. per 1000 c.ft. in the price of gas, as from April 1. This, with a reduction of 4d. from Oct. 1 last, makes a total reduction of 10d.

The Selkirk Gas Company are reducing the price of gas by 10d., which will make it 5s. per 1000 c.ft. At Dunbar 10d. is also being taken off. The rate at Slamannan is very high; and a reduction now made leaves the price at 11s. 0½d. per 1000 c.ft.

Four men were injured, one of them seriously, by an explosion at Kent's engineering works, Luton, last Saturday. It is stated that a match was ignited to re-light a drying oven from which the gas was escaping. The swing doors of the oven were blown off.

The Secretary of the Maybole Gas Company sent the Town Council a letter in regard to the Company being expected to pay one-half of the cost of the digging of a trench in which water and gas pipes for some new houses are to be laid. The position of the Company is that they are not bound to extend their mains except upon their own terms and conditions. A conference ended in a satisfactory arrangement.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Stoke-on-Trent Corporation (Gas Consolidation) Bill: Reported with amendments.

HOUSE OF COMMONS.

The following Committee has been appointed, and commenced its sitting yesterday (Tuesday), to consider, among others, the Sheffield Gas Bill: Colonel F. S. Jackson (Chairman), Mr. Betterton, Mr. J. D. Hope, and Mr. Royce.

Croydon Gas Bill.

It was reported from one of the Examiners of Petitions for Private Bills that in the case of the petition for the Croydon Gas Bill the Standing Orders had not been complied with. The report was referred to the Select Committee on Standing Orders.

Gas Regulation Act, 1920.

A copy was presented of a draft of a Special Order proposed to be made by the Board of Trade under section 10 of the Gas Regulation Act on the application of the Grays and Tilbury Gas Company.

Public Utility Companies (Capital Issues) Act, 1920.

Copies were presented of reports by the Board of Trade under the Act on applications by the Andover Lighting and Power Company, and the Ferndale Gas Company.

Scientific Research.

Under Class IV. of the Civil Service Estimates, which came before the House last week, were the sums of £75,000 for scientific investigation, &c., and £100,000 for scientific and industrial research.

Imported Glassware and Taxation.

Major BARNES asked the President of the Board of Trade whether the Committee who sat in December and January last to hear evidence under the Safeguarding of Industries Act, in connection with domestic, illuminating, and mounting glassware, had yet completed their inquiry; whether their findings had been embodied in a report. If so, whether the report was unanimous or not; when it was received by him; and whether he proposed to make an order imposing an import duty.

Mr. BALDWIN replied that the Committee submitted their report on Feb. 18, and it was proposed to present this and other reports to Parliament and publish them in the ordinary course. In the meanwhile, he did not think it desirable to make any statement as to their nature or contents, or regarding any action which it might be proposed to take.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

Rules for Special Order Applications.

Under date of March 1 there has been issued [price 2d. net] the Gas (Special Orders) Rules, 1922, made by the Board of Trade with respect to applications for Special Orders under section 10 of the Gas Regulation Act, 1920. The rules come into operation from the date named.

Edenbridge and District Gas Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are 4s. 6d. and 5s. per 1000 c.ft.; and the prices they have asked the Board of Trade to substitute for these are 1s. 7d. and 1s. 8·2d. per therm.

Ilkley Urban District Council.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 3d. per therm.

SPECIAL ORDERS.

St. Alban's Gas Company.

A Special Order is to be applied for by the Company to empower them to borrow further money, to authorize profit-sharing, to permit the purchase of further land, &c., and to make additional provisions with regard to the supply of gas and administration.

East Hull Gas Company.

The Company have applied for a Special Order to authorize them to purchase additional lands and to raise further capital, and to make provisions with regard to the supply of gas and administration.

DECLARATIONS OF CALORIFIC POWER.

Ascot District Gas and Electricity Company.—475 B.Th.U. (March 31.)
Brecon Gas Company.—450 B.Th.U. (March 20.)
Farnham Gas and Electricity Company.—460 B.Th.U. (March 25.)
Gas Light and Coke Company.—500 B.Th.U. (June 15.)
Hitchin and District Gas Company.—500 B.Th.U. (March 25.)
Hoddesdon Gas and Coke Company, Ltd.—480 B.Th.U. (March 20.)
Ilford Gas Company.—500 B.Th.U. (June 15.)
Manningtree and Mistley Gas Company.—550 B.Th.U. (March 25.)
Oakengates and St. George's Gas and Water Company.—500 B.Th.U. (June 17.)
Sheppey Gas Company.—460 B.Th.U. (March 18.)

ALTERATION OF DECLARED CALORIFIC VALUE.

South Metropolitan Gas Company.—The Company give notice, in compliance with the provisions of their Act of 1920, that on and after June 17 the declared calorific value of the gas supplied by them will be 560 B.Th.U.

GAS REGULATION ACT ORDERS.

Copies have been forwarded by the Director of Gas Administration of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Dorking Gas Company.

As from the declared date: (1) The maximum price in respect of gas supplied by the undertakers shall be 19d. per therm; and this price shall be substituted for the price of 5s. 3d. per 1000 c.ft. mentioned in section 5 (limiting price of gas) of the Dorking Gas Act, 1901. (2) "0·6d. per therm" shall be substituted for "3d. per 1000 c.ft." in section 5 of the Dorking Gas Act, 1901. (March 11.)

Hitchin and District Gas Company.

After the declared date, the standard prices in respect of gas supplied by the undertakers shall be 14d. and 15·2d. per therm; and these prices respectively shall be substituted for the prices of 3s. 6d. and 4s. per 1000 c.ft. mentioned in section 51 (dividends dependent on price charged) of the Hitchin and District Gas Act, 1905.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by five-and-one-half.

Prepayment meter clauses are included. (March 15.)

Luton Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 15·6d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-four-fifths.

Prepayment meter clauses are included. (March 16.)

Redditch Gas Company.

After the declared date, the standard prices in respect of gas supplied by the undertakers shall be 16d. and 17·2d. per therm; and these prices respectively shall be substituted for the prices of 4s. 6d. and 5s. per 1000 c.ft. mentioned in section 59 (dividend dependent on price charged) of the Redditch Gas Act, 1899.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-two-thirds.

Prepayment meter clauses are included. (March 16.)

Sittingbourne District Gas Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16d. per therm. (March 10.)

Swaffham Gas Light and Coke Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 18d. per therm; and this price shall be substituted for the price of 5s. 6d. per 1000 c.ft. wherever it occurs in section 21 (price of gas) of the Swaffham Gas Order, 1901.

As from the declared date, "therm" shall be substituted for "1000 c.ft.," and "fifth of a penny" for "penny" wherever it occurs in paragraph (2) of schedule B to the Swaffham Gas Order, 1901. (March 14.)

Whitchurch (Salop) Gas Company, Ltd.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 17·2d. per therm; and this price shall be substituted for the price of 4s. 7d. per 1000 c.ft. wherever it occurs in section 27 (price of gas) of the Whitchurch (Salop) Gas Order, 1898.

As from the declared date, "therm" shall be substituted for "1000 c.ft.," and "fifth of a penny" for "penny" wherever it occurs in paragragh (ii.) of schedule B to the Whitchurch (Salop) Gas Order 1898. (March 14.)

Reduction in Price at Sileby.—At the Sileby Council meeting, last week, the Lighting Committee reported that, as a result of an interview with the Gas Company, a reduction of 6d. per 1000 c.ft. would be made in the price of gas as from Jan. 1, with a further reduction from July 1.

Finances at Bridgnorth.—Attention was called by Mr. A. G. Lloyd, at the monthly meeting of the Bridgnorth Town Council, to the unsatisfactory financial condition of the gas-works. He contended that the quarterly reports of the Committee did not give the information the Council might have. He moved that the Gas Committee be asked to report quarterly respecting the previous quarter, the quantity and average price per ton of coal received, the quantity carbonized, the approximate amount in stock at the end of the quarter, the gas made and sold, the residuals sold, the wages paid, and the overhead charges. The Chairman of the Gas Committee had told them that the figures given him were so staggering that he dare not state them, for fear of being wrong. On Jan. 1, 1921, they had a credit balance of £368; and on Jan. 1, 1922, they had a debit balance of £607. The resolution was unanimously adopted.

SHEFFIELD GAS COMPANY.

Satisfactory Progress Reported.

The 122nd Ordinary General Meeting of the Company was held in the Cutlers' Hall, Sheffield, on Monday of last week—Colonel H. K. Stephenson, D.S.O., M.P., presiding.

The Chairman, in moving the adoption of the report and accounts for the past year, said he was glad to be able to record satisfactory progress, in spite of the difficult times through which they had passed. As to the coal strike, the Company met this test of endurance undismayed, and emerged undefeated. Under their Gas Regulation Act Order, the Company had declared a calorific value of 480 B.Th.U. He was afraid there was still considerable misapprehension in the minds of the public as to the policy and result of the Order. As a matter of fact, the only relief the undertaking received by the Order was permission to pay the statutory dividend of 5 p.ct. in conjunction with prices adjusted to meet the changed conditions caused by the war. As they were all aware, in pre-war days, and up to the time, in fact, of Government control of coal, the Company were in a position to supply gas at what was practically the lowest price in the country. This was mainly due to Sheffield's geographical position in relation to the coalfields. With the control of coal, this advantage disappeared; and the Company had to pay the same prices for coal as other gas undertakings. These were still being paid. This was one of the legacies of the war from which the Company still suffered; and only the future could prove whether Sheffield would ever again reap the full benefit of its geographical situation. Prices of residuals were still falling. Before the war, the Company were fortunate enough to be able to sell residuals at prices in excess of the cost price of coal; but this was far from being the case to-day. The price charged for gas by the Company now—3s. 7d. per 1000 c.ft. to ordinary consumers—was one of the lowest in the kingdom; and he believed he was right in saying that there was no other large industrial centre where the price was below 4s. 6d. per 1000 c.ft. So the complaint that Sheffield manufacturers could not compete with other firms located in other cities and towns because of the high price of gas, would appear to be fallacious. Satisfactory progress had been made in the matter of repairs during the past year; and, excepting for the restricted period of the coal strike, an average value of over 500 B Th U. had been maintained—the gas examiner's quarterly report to Dec. 31 showing an average of 511 B.Th.U. From this they would see that the consumer was in no wise prejudiced by the declaration of 480 B.Th.U. The gas examiner's report was sufficient reply to the uninformed criticisms on the quality of gas supplied by the Company. As to the coal trouble, the Board prepared for a long strike, and large extra stocks of coal were laid in—a policy amply justified by events. The consumers of Sheffield were safeguarded, not only as regarded supplies, but also as regarded the price of gas, which was not increased, as in cases of undertakings which were obliged to purchase foreign coal at the prohibitive prices asked. During the strike, too, the Company were not only able to keep the city supplied with coke, but were able to come to the assistance of the electricity supply department of the Corporation with coke breeze and tar, to enable them to burn the bad-quality coal they were obliged to employ. All this was done at a time when additional demands were being made on the Company's plant, owing to the very considerable quantities of coke-oven gas normally taken being entirely cut-off at the commencement of the strike. No reference which he could make to this difficult period would be complete without an expression of warm appreciation of the services rendered from first to last by Mr. Ralph Halkett. Both the Company and the consumers were greatly indebted to him for the unfailing energy and resource which he displayed; and it was unnecessary to say that he was most efficiently supported by his staff. There was a decrease of nearly 13 p.ct. in the consumption of gas during 1921. This was entirely due to the great trade depression, entailing a loss of both industrial and domestic consumption. In spite of this, the domestic load showed an increase, which but for the abnormal conditions would no doubt have been much greater, and which proved that the policy of the Company in developing this side of the business was a sound one. The Company had for some time past been taking coke-oven gas from the Tinsley Park Colliery; and a supply from the Orgreave Colliery was brought into operation on Dec. 1. The quantity was some 2 million c.ft. per day. Up to now, the quality of this supply had been quite satisfactory. The new chemical works at Grimesthorpe had been completed; and the making of acid and sulphate of ammonia was now taking place with very satisfactory results. The old chemical works had been shut down. At the Neepsend works, the installation of vertical retorts by the Woodall-Duckham Company was going on well; and it was hoped to bring them into operation next August. In order to improve the supplies in the district, about five miles of high-pressure mains had been laid; and the compressors were being installed at the Effingham Street works. They hoped to complete this work at an early date.

The report was adopted; and a dividend of 2½ p.ct. was declared on the "A." "B." and "C" stocks, for the half year ended Dec. 31.

The General Manager (Mr. Ralph Halkett), replying to a vote of thanks, said he was pleased that the spirit of unrest among the employees had gone, and now they all worked together with the object of giving service to the Company and the consumers. Proof of this was seen during the coal strike. That was a very difficult time; and it was only because of the splendid services rendered by the staff and employees that they were able to carry through successfully.

Shotley Bridge Gas Company.—At the annual meeting of the Company, the Chairman (Lieut.-Col. W. H. Ritson) said the Directors had experienced a very anxious time, but they were able to declare a dividend of 3¾ p.ct. for the year, which was the maximum they were authorized to pay under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918. The revenue for the year was £31,418, and the expenditure £29 498. The Company had avoided opposition from the local authorities to the new price per therm.

ILFORD GAS COMPANY.

The report submitted and adopted, with the accounts for the year ended Dec. 31, at the annual meeting of the Company on the 6th inst., stated that the Directors obtained from the Board of Trade on June 24 an Order substituting for the then existing standard price of 4s. 6d. per 1000 c.ft. a new standard price of 18·2d. per therm. After payment of the interim dividend to June 30 at the rate of £7 5s. p.ct. per annum on the "A" and "C" stocks, and £5 15s. p.ct. per annum on the "B" stock, less income-tax, and providing for the fixed charges, there remained the sum of £10,690 available. The Directors recommended a dividend for the past half year at the rate of £7 5s. p.ct. per annum on the "A" and "C" stocks, and £5 15s. p.ct. per annum on the "B" stock, subject to income-tax. These payments would amount to £6340, and leave a balance of £4050 to be carried forward.

The Chairman (Mr. William Ashmole) said it was with mingled feelings of regret and pleasure that he occupied the chair on that occasion—deep regret at the knowledge that this was to be his last appearance as Chairman of the Ilford Gas Company, and pleasure owing to the fact that the Board were in a position to present such a favourable balance-sheet. Looking at the revenue account, under the manufacture of gas the various items totalled £134,845; and this showed an approximate decrease of £10,000 over the previous year. Distribution was £1000 less. The total amount on the debit side was £169,226, as against £179,022, a decrease of £9796. On the credit side, gas brought in about £13,000 more, and rental of meters, stoves, and fittings an increase of about £5000. Residual products, however, showed a decrease of £11,000. The total revenue was £193,054, as against £186,845, or an increase of £7209. In common with other industries, they were now beginning to reap the advantage of lower prices, not only in materials, but also in labour. The year under review, however, did not reap the full effect of these savings. The Company passed through an anxious time during the coal strike. Fortunately the stocks held at the commencement of the strike were fairly large; and they were able to carry right through without having to purchase any foreign coal. The new carbonizing plant and power house were now at work, having been brought into use a few weeks ago. The district work had received full and careful attention. The outdoor staff were at present engaged in laying mains and services and fitting-up the houses on the new City of London estate, which would no doubt materially augment the future output. The Ilford Company would continue as a Company to the end of June next, and be responsible for the general carrying-on of the works and business until that date. It was, therefore, in the interests of the stockholders to have the business conducted in a proper manner right up to that time, so that they might hand over to the Gas Light and Coke Company the undertaking in the same state as it would have been in the ordinary way. The stockholders, naturally, expected this to be done—particularly as they would still continue to be part-owners after the amalgamation.

The Chairman, replying to a vote of thanks, said he had been a Director of the Company for 44 or 45 years; and, as he had said, it was with great regret that he had to terminate his connection with the undertaking. When his father was Managing-Director of the Company, there was only one man employed to stoke the retorts and do everything that was necessary, and also look after the fittings. He was quite certain the proprietors would not suffer in the long run by having become stockholders in the Gas Light and Coke Company.

The Engineer and Manager (Mr. W. B. Farquhar) said the Ilford Gas Company was one of which he had always been proud. He thanked the Board on behalf of the staff and employees for the very liberal and sympathetic way in which they had always dealt with anything brought before them for the good of the men and of the works.

The Secretary (Mr. G. H. S. Iorns) remarked that the 23 years during which he had been connected with the Company had been years of pleasure.

TYNEMOUTH GAS COMPANY.

A Further Reduction in Price.

The Annual Meeting of the Company was held on Tuesday of last week at the Offices, North Shields—Mr. Thomas Young (the Chairman) presiding.

The Chairman, in moving the adoption of the report and accounts, referred to the death of Mr. J. B. Williamson, who was for 25 years Chairman of the Company. He (Mr. Young) accepted the position with considerable anxiety, as they were then in the midst of the greatest and most disastrous coal dispute that had ever taken place. The quantity of gas sold last year was nearly 29 million c.ft. less than in 1920, or a reduction of 4·99 p.ct. The revenue was up for gas and rentals by £34,565, but was down on residuals by £73,420, thus showing a net loss on the balance of these items in the revenue account for 1921 of no less than £38,855. The year 1921 was one of crises, of heavy losses in many directions, and of hope deferred. The great coal strike, the markets for secondary products, the length and abnormal heat of the summer, and great trade depression, were all prominent in their effects upon the trading of the year. He thought he might say with some satisfaction that the fact of their consumers having passed through the critical period of the coal stoppage with so little inconvenience and discomfort was largely due to the foresight and enterprise which enabled the Company to maintain almost generous supplies throughout. Towards the end of May, the stocks of coal had diminished to such an extent that it became clearly necessary to obtain coal from abroad, if the gas supply to the town was to be maintained. They therefore made arrangements, in conjunction with neighbouring gas companies, to purchase large quantities of coal from various sources at a cost about two-and-a-half times that charged for good gas coal in this country before the strike. The quality of most of this coal proved very poor from a gas-making point of view, and, from the important view of residuals, almost negligible. In the last few weeks of the strike, the cost of manufacturing gas was approxi-

mately 10s. 6d. per 1000 c.ft., for which they were charging 5s. 6d. —a loss of 5s. per 1000 c.ft. What really saved the situation in those critical days was that when the stoppage began, they had been for some time installing a carburetted water-gas plant of a daily capacity of a million c.ft. In normal times this would not have been completed and ready for work for another month or two. Mr. F. C. Willis (their Engineer), however, determined that it should be brought into operation by abnormal means. By laying large numbers of temporary pipes from the boilers, and from the new installation, to existing plant, this was accomplished, and the water gas generated and mixed with the coal gas from the retorts. But for this most opportune help, it was almost certain the works would have had to be closed-down some weeks before the strike came to an end. He was very pleased to announce that the Directors had just decided to make another substantial reduction in the price charged for gas, and that, from the reading of the meters at the end of the present quarter, the new charge would be at the rate of 4s. 9d. per 1000 c.ft., or a reduction of 6d. from the present figure. If they brought the new system of charge into operation at the beginning of next quarter, this would be equivalent to 12·1d. per therm.

The report was adopted, and dividends of 3½ and 4 p.ct. on the consolidated and new ordinary stock and preference stock respectively were declared.

FURTHER STORAGE CAPACITY FOR BIRMINGHAM.

Reporting on Tuesday, the 7th inst., to the Birmingham City Council, the Gas Committee recommended that they be authorized to proceed with certain mainlaying work at an estimated cost of £54,000, and that the Town Clerk be instructed to apply for the appropriate authority for sanction to borrow this sum. They also said that the margin of safety in the capacity of the carbonizing plant has, owing to the output in recent years, been gradually reduced, and has given the Committee some concern; but by reconstruction of the manufacturing plant at the various gas-works, and the adoption of new methods of carbonization of coal, the total capacity has been materially increased. This has enabled the demand to be adequately met from the existing works, and rendered possible the postponement of the erection of new works at Washwood Heath. The reconstructed manufacturing plant will enable the demands for gas to be met for the next six or seven years; but the new works will then be required (assuming a normal growth of output), and expenditure upon them may have to be incurred during 1923. Plans have been prepared and a model constructed of the proposed lay-out of the new works, which it is estimated will, when finally completed, have a manufacturing capacity of 20 million c.ft. per diem. A heavy capital expenditure will be necessary in the building and equipment of these works; but the construction will be proceeded with in stages and will be deferred as long as possible, and the approval of the Council obtained from time to time. When it becomes necessary to put the work in hand, it is hoped the cost of both materials and labour will be appreciably less than they are now. It is imperative, however, that further storage accommodation should be provided at once; and it is proposed to erect two five-lift gasholders at Washwood Heath, each having an ultimate capacity of 10,000,000 c.ft. In order to keep down expenditure to the lowest possible limit, the Committee, after careful consideration, have decided only to construct three of the lifts immediately, leaving the other two to be added when the necessity arises. The three-lift holders will each give a capacity of 5,899,000 c.ft., which should suffice for some years. The present holder capacity is small in relation to the make and output of gas; and additional storage is needed owing to the impossibility of carrying out extensive repairs or additions to the existing holders without putting one or more out of action—a contingency which cannot be contemplated until further accommodation is provided. An estimate has been prepared of the cost of the construction of the tanks and the erection of the two holders, the diversion of a small stream, and the laying of temporary railway lines, trunk mains, and other plant. This amounts to £347,655.

Moving the adoption of the report, Alderman J. H. Lloyd, explaining the necessity for an extension of the storage capacity, said that, though their maximum daily demand for gas was upwards of 56 million c.ft., their total effective storage capacity to-day was only 35 millions. The time had come when the matter could not be longer delayed, if adequate pressures were to be maintained on the district.

The resolution was adopted.

Gas Light and Coke Company's Special Order.—In the Court of Common Council of the City of London Corporation last Thursday, the question of the application by the Gas Light and Coke Company to the Board of Trade for a Special Order under section 10 of the Gas Regulation Act, 1920, was referred to the City Lands and County Purposes Committee for consideration. Replying to Mr. Ellis, the Remembrancer (Colonel H. Stuart Sankey, C.V.O.) stated that the object of the application was, among other things, to give the Company power, should the occupier of any part of a building desire a supply of gas, to run their pipes through the whole building without any compensation to the owner of the building except for actual damage. He had already taken steps to oppose the application.

Wages at the Ellesmere Gas-Works.—The question of the reduction in the wages of the men employed at the gas-works was brought before a meeting of the Ellesmere Urban Council, when it was proposed that the matter should be deferred so that the new Council might settle it. The Chairman (Mr. B. R. C. Tower) said the Council were making application to the Ministry of Health for certain financial assistance; and it was quite possible they would ask the Council what they were doing towards lessening expenses, and inquire the reason why they were paying the same wages as during the war, when the standard was much higher than now. He thought it would be wiser for the Council to be in a position to consider the question of wages at the same time as they were reviewing the financial position in conjunction with the working and management of the gas-works. This course was agreed to.

RAILWAY RATES ON COKE AND BYE-PRODUCTS.

Representatives of the National Association of Coke and Bye-Products Plant Owners have been discussing with the railway companies' general managers at the Railway Clearing House, the question of a reduction of the rates and shipment charges on the products of the members. The "Iron and Coal Trades Review" reports that a powerful case was presented by Lord Gainford, who is the Chairman of the Association. He particularly pressed for:

(1) The entire removal of the flat-rate increase.
(2) The reduction of the percentage in increase in railway rates by at least a further 25 p.ct.—viz., from 75 p.ct. to 50 p.ct. above pre-war rates.
(3) The reduction of wharfage and shipping charges to a figure representing not more than 50 p.ct. on the separate charges in operation prior to the war.

The output of coke from the ovens of the Association members, he stated, aggregated 10,199,190 tons during 1920, in addition to which there were enormous quantities of bye-products. An output of 10,000,000 tons entailed the purchase of some 17,000,000 tons of coal, a large proportion of which had to be conveyed a short distance by the rail from the collieries to the coke-ovens. Hence it was of the utmost importance to the Association that the rail rates on coal should be brought down as much as possible.

The incidence of the flat-rate, coupled with the 75 p.ct. increase, was most serious in respect of this short-distance traffic, and the Association, therefore, strongly pressed for the abolition of the flat-rate increase. The seriousness of the position could be seen from the fact that coke output had fallen from about 13 million tons to about 2½ millions in 1921.

The railway companies should bear in mind that in the case of coke they received not only the transport charges on the manufactured coke, but also from a large quantity of coal used in the ovens. As over 30 cwt. of coal was used in the production of each ton of coke, the railway companies received a two fold increased revenue out of the product, with total flat rates amounting to 10d. per ton—6d. on each 30 cwt. of coal and 4d. on each ton of coke. A considerable revenue from rates was also derived from other inward traffic to coking plants, such as stores and material.

With respect to the export trade, it was urged that shipping charges should be considerably further reduced to assist in bringing about a revival, and to enable an additional quantity of coke to be made for export.

Railway rates had not fallen in anything like the same ratio as the reduction in the cost of all classes of railway stores, coal, and other material. All branches of industry in the country had to bear their share of the general trade adversity; and it was not fair that the railway companies should endeavour to preserve their position from loss by maintaining rates at such a high level as merely accentuated the unfortunate position of traders.

In conclusion, it was requested that a deputation from the Association should be received by the railway managers at an early date to discuss the whole position.

A SMOKE ABATEMENT DEPUTATION.

On Monday of last week, a deputation organized by the Coal Smoke Abatement Society waited on the Minister of Health (Sir Alfred Mond), to urge the Government to give legislative effect to the recommendations of Lord Newton's Departmental Committee on Smoke Abatement. The Minister was accompanied by Sir H. Kingsley Wood, M.P. Among the members of the deputation were Lord Newton, Mr. D. Milne Watson, Mr. Thomas Hardie, Mr. T. Goulden, Mr. E. V. Evans, Mr. F. W. Goodenough, Dr. R. Lessing, Prof. A. H. Barker, Dr. H. A. Des Vœux, Dr. John Owens, and Dr. C. W. Saleeby.

Sir ASTON WEBB, P.R.A., in introducing the deputation, said the inquiry by Lord Newton's Committee was the first official inquiry held into the subject of smoke abatement for nearly seventy years; and the public saw with interest that the Committee were clearly of opinion that a great deal of the smoke from factories and commercial premises was unnecessary, and might be avoided. The smoke was a demoralizing and unnecessary evil. It led to immense waste of fuel; and the destruction it involved represented many millions a year. Much, no doubt, was due to domestic smoke, which, perhaps unfortunately, it was not proposed to deal with.

Sir W. NAPIER SHAW said he was Chairman of the Committee on Atmospheric Pollution, who had been engaged in measuring the amount of dirt in the atmosphere. Their instruments had enabled them to ascertain during the last two years that the air of West London kept quite clean during the night, and began to get dirty again when people began to go about their business. They had been able to draw the conclusion that in residential London domestic smoke was responsible for two-thirds of the problem. If legislation was to be more than partially efficient, it must not be limited to the recommendations of the Committee, but must deal with the domestic problem as well. He asked the Minister to consider a method of encouragement by which those who were rated for houses that made no smoke should have an abatement in their rates.

Sir ALFRED MOND replied that no one who had seen the clouds of smoke which hung over the great industrial cities could donbt the importance of this subject. There was no reason why factories should emit black smoke, or any smoke. It merely showed bad management. With mechanical stoking and careful watching, less smoke would be emitted, and less coal would be burnt. There was no doubt that things were moving on; but he imagined that general legislation tending to force the pace too much at the present time would only wreck any measure he might introduce. It would be an excellent thing if there were more propaganda on this matter. The question arose, How far could they proceed by legislation or administration to improve

matters? The Ministry of Health had not waited either for deputations or legislation to make a start. One of the recommendations of the Committee was that the Minister of Health should appoint one or more competent advisers with a view to advising local authorities and manufacturers. This had already been arranged for. There were many suggestions in the report conceived on moderate lines; and he could not say until he had considered the whole report whether or not he would be in a position to adopt all the machinery the Committee recommended.

TRADE NOTES.

Purifiers for Bushey.

The Horseley Bridge and Engineering Company, Ltd., of Tipton, have received from the Watford Gas Company an order for the delivery and erection complete at their gas-works at Bushey of three cast-iron purifiers 24 ft. by 12 ft. by 8 ft. deep, with 18-in. hydraulic valves and connections.

"Victaulic" Joints.

The Victory Pipe-Joint Company, Ltd., of No. 28, Victoria Street, S.W., in forwarding a copy of the revised price list of their patent "Victaulic" leak-proof joints, point out that arrangements have been made with a number of British tube manufacturers for the supply of tubes with ends to suit the "B" type "Victaulic" joint. The Victory Pipe-Joint Company do not supply pipes, confining their activities to the supply of joints only; but most of the firms they mention are ready to quote for pipelines complete with "Victaulic" joints. In a large number of applications—particularly medium and larger sizes of pipes—a substantial economy is, the Company point out, shown by the use of the "Victaulic" joint, as compared with the cost of pipelines equipped with conventional joints. The following are the tube manufacturers with whom the arrangements to which the Company refer have been made: The British Mannesmann Tube Company, Ltd.; Bromford, Ltd.; Cochrane & Co., Ltd.; The Ebbw Vale Steel, Coal, and Iron Company, Ltd.; Hildick and Hildick; Howell & Co., Ltd.; H. Incledon & Co., Ltd.; Monks, Hall, & Co., Ltd.; The Perfecta Seamless Steel Tube Conduit Company, Ltd.; Thomas Piggott & Co., Ltd.; C. M. Powell Bros.; The Scottish Tube Company, Ltd.; Stewarts and Lloyds, Ltd.; Tubes, Ltd.; The Wednesbury Tube Company, Ltd.; and The Weldless Steel Tube Company, Ltd.

"Meldrum" Mechanical Stoker.

There has been forwarded by Messrs. Meldrum, Ltd. of Timperley, near Manchester, a copy of a new list dealing with their mechanical stokers, which are largely in use by manufacturers in a great variety of industries, including a number of gas departments. Incidentally it may be mentioned that the firm have just been favoured with their third repeat order by the British Cotton and Wool Dyers' Association, Ltd. The firm claim, in connection with their mechanical stoker, that long experience and numerous tests have enabled them continually to improve the design and construction, so as to put them far ahead of all competition in efficiency and reliable working; and they point out the need for seeking economy in steam-raising plants, with fuel and labour at present costs. Also the mechanical stoker is of great value in overcoming the smoke nuisance. The fuel is fed-on evenly as the load demands; and the air is supplied exactly in the the correct proportion to give the best results. The "Meldrum" stoker was the first machine upon which the steam-jet forced draught was used; and the success of the machines is said to be due in a great measure to the employment of this system, by which a large increase in boiler output is obtained. Higher temperatures are realized, ensuring the most complete combustion and maximum efficiency. The stoker must, of course, be suited to the conditions prevailing; and the firm make a special study of every installation, before putting forward their recommendations. They examine carefully the nature of the load, and of the fuel used or obtainable. They are also prepared to carry out, at their own expense, fuel and evaporation tests. Then they are in a position to decide which of their various types of stoker it will be best to instal, and to guarantee the saving they can effect. In the list before us the design and construction of the different forms of "Meldrum" stoker are described, by the aid of a number of illustrations. Reference is also made to the firm's unit coal-elevator feeding a mechanical stoker, which meets a growing demand for a labour-saving device in the modern boiler-house.

Budget Meeting at Birkenhead.—Reviewing the estimates of the different Committees at the budget meeting of the Birkenhead Corporation, Alderman R. J. Russell (the Chairman of the Finance Committee) remarked that the disastrous coal strike had added materially to the difficulties of the gas undertaking during the year; and a working loss of £45,000 had resulted. By 1923 the Committee hoped to wipe-off the deficit. Among the 82 county boroughs, 32 charged more for their gas than did Birkenhead, six were on the same level, and only nine were below the 4s. per 1000 c.ft. charge.

The Romance of Artifical Lighting.—This formed the subject of a popular lecture given at Herne Hill by Mr. W. J. Liberty on Tuesday, the 14th inst., when the chair was taken by Dr. J. S. G. Thomas, of the South Metropolitan Gas Company. The large audience included members of the staffs of the Gas Light and Coke, the South Metropolitan, and the South Suburban Gas Companies. Dr. Thomas introduced the lecturer, who, he said, had accumulated a vast amount of information in respect to artificial lighting, both ancient and modern; and they were sure of an interesting evening. Mr. Liberty then, with the aid of a large collection of beautiful lantern slides, sketched the story of lighting by man. After the lecture, Mr. H. T. Nunn, B.Sc., proposed a vote of thanks to Dr. Thomas for presiding and to Mr. Liberty for his instructive lecture. Mr. Leon Gaster, in seconding, paid a tribute to Dr. Thomas and also to the lecturer, who in a marvellously short space of time, and in a most fascinating manner, had taken them from primitive man with his fire-light to the newest and most up-to-date forms of illumination. Mr. Liberty was certainly a master of his subject.

MODERN PUBLIC LIGHTING.

Views of a Glasgow Corporation Deputation.

The Glasgow Corporation recently appointed a deputation to visit and inspect the lighting systems in operation in London and elsewhere.

In their report the deputation state that in the City of London little or nothing has been done in the way of improvements on the 1914 system; but that system was of the highest character. The streets are lit with Oliver arc lamps having Peard prismatic reflectors, and with Keith high-pressure gas-lamps. Most of these are suspended on wires stretched from wall to wall. In Westminster, some experiments are being tried with gas-filled electric lamps in refractor bowls; but this method of use did not appear to give the best results from the appliances installed. Their high-pressure gas-lamps are ample in lighting yield, but would be much more effective if placed at a greater height above the street. In many of the smaller boroughs of London tentative experiments are being made with gas-filled lamps; but it is evident that the investigations were not being conducted with very great scientific acumen. The experiments were more or less haphazard. A lamp seemed to be put up; and if it were apparently effective, good and well If it were not, then one having a greater yield of light was tried, without consideration as to the best means, by accessories, of using the light to the greatest advantage.

There seemed to be no extension meantime of high-pressure gas lighting in any of the places visited. This is thought to be due to the high cost of maintenance. There is no doubt that the light yield from the high-pressure gas is as good as, and in many cases better than, that to be obtained from other sources. But costs are an important consideration; and it is essential that maintenance work be reduced to a minimum.

In Paris, the question of aids to lighting was carefully gone into; and the contrast between the sombre buildings of Glasgow and the buildings of light-coloured stone in Paris were at once apparent in the gain in lighting effect. Glasgow is more difficult to light than any other city from this circumstance; the dull blackness of the buildings absorbing so much light. Methods of keeping the pavements free from the interruption of traffic caused by cast-iron pillars were noted with interest in Paris. The spacing of the lamps is exceedingly close in the Parisian main thoroughfares; and the lighting is divided equally between gas and electricity.

The report mentions that information is being collected as to the lighting of many American cities where gas-filled electric lamps are being freely used.

Market Harborough Gas Prices.—The Market Harborough District Council have adopted a recommendation of the Gas Committee that 10 p.ct. discount be allowed for prompt payment to consumers of gas through ordinary meters for the current quarter; that the price of gas to those consumers be also reduced by 3d. to 5s. per 1000 c.ft. (less 10 p.ct. discount for prompt payment) as from April 1 next; and that stove and meter rentals charged to prepayment meter consumers be abolished as from Jan. 1, 1923.

Wellington (Salop) Gas Company.—The business of the Company continues to expand; and at the recent meeting a dividend making 6½ p.ct. for the year (less tax) was declared, in accordance with the Gas Regulation Act Order, under which the old standard of 3s. 9d. per 1000 c.ft. is replaced by 1s. 2d. per therm. Under the terms of the agreement between the Company and the Oakengates Gas and Water Company, Ltd., the two undertakings will become merged on July 1 next. Presiding at the meeting, Mr. C. W. Leake said it was intended to instal new carbonizing plant. Mr. R. J. Milbourne, in seconding the adoption of the report, remarked that, considering the loss entailed by the coal stoppage, the balance-sheet was eminently satisfactory.

Prepayment Consumers at Middlesbrough.—In response to an appeal from labour bodies asking for a discount on slot-meter payments equivalent to that allowed to persons who pay for the gas periodically, the Middlesbrough Gas Committee have decided to take no action. The Chairman (Alderman Calvert) reported upon the factors taken into account in fixing the quantity supplied to the penny-in-the-slot users, and the advantages given to this class of consumer. The basis of charge, he said, was the same as for the ordinary consumer; and it was not possible at present to increase the quantity of gas for a penny. If there were no difficulties like the stoppage of last year, and things went on as they now promised, in a very short time the Committee would be able to make a substantial reduction in the price of gas.

Blyth Gas Company.—Mr. Alexander Watt (the Chairman), at the annual meeting of the Company, reviewed the past year's working, and spoke of the success that had attended the undertaking. He also referred to the loss sustained by the resignation through failing health of Mr. R. J. Dobson, who had since 1911 presided over the Directors. As to the troubles of the past year, fortunately at the time of the miners' strike they held a good supply of coal; and, with careful handling of the stocks to the best possible advantage, they were able to maintain the usual supply of gas over the whole period, without importing any coal. The profit for the year on revenue account was £4176. The position had so much improved that the Directors felt justified in announcing a reduction in the basic price of gas, retrospective from the December readings, to 1s. per therm. The number of consumers was gradually increasing. With this basic price, the dividend for the current year would be at the rate of 7½ p.ct. per annum, which was nearly approaching the pre-war rate. As to the working results, the make of gas had been equal to 17,894 c.ft. per ton of coal; and the sales showed an increase of 4 p.ct. over 1920. Mr. A. C. Hovey, in seconding the adoption of the report, said that in the year 1910 the coal carbonized was 10,000 tons, yielding in gas 118 million c.ft.; while in 1921, with 10,069 tons of coal carbonized, 180 millions were produced. These figures were only possible with the modern methods of carbonization adopted by the Company.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March* 20.

The market for pitch maintains its firm tone, and makers are now practically sold out. The price is firm at from 75s. to 80s. per ton. Orders for road tar are now beginning to flow in; and it looks as if very large quantities will be taken during the summer. The price is inclined to firm up. Creosote is steady at about 6¼d. per gallon, net in bulk. Solvent naphtha has been in a little better demand at about 2s. 9d. to 3s. per gallon for 95/160 quality. Pure toluole and pure benzole are about 3s. to 3s. 3d. per gallon. There is a fair amount of inquiry for pyridine, and the supply is short; the price being called about 6s. 6d. per gallon for 90/140. In other products there is nothing new to report.

Tar Products in the Provinces.

March 20.

The average values for gas-works products during last week were: Gas-works coal tar, 35s. to 40s. Pitch, East Coast, 72s. 6d. to 75s. f.o.b. West Coast—Manchester, 67s. 6d. to 70s.; Liverpool, 67s. 6d. to 70s.; Clyde, 70s. to 72s. 6d. Benzole 90 p.ct. North, 2s. 1d. to 2s. 2d.; crude 65 p.ct. at 120° C., 1s. 5d. to 1s. 7d. naked at makers' works; 50-90 p.ct., naked, North, 2s. 1d. to 2s. 2d. Toluole, naked, North, 2s. 2d. to 2s. 5d. nominal. Coal tar crude naphtha in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 2s. 2d. to 2s. 4d. Heavy naphtha, North, 2s. 1d. to 2s. 3d. Creosote, in bulk, North, liquid, 4½d. to 4⅝d.; salty, 4⅜d. to 4⅝d. Scotland, 4⅜d. to 4½d. Heavy oils, in bulk, North, 6d. to 6¼d. Carbolic acid, 60 p.ct., 1s. 10d. to 2s. Naphthalene, £12 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. to 6d. per minimum 40 p.ct.; "B" unsaleable.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

There is not much change in the market for tar products, though an increased amount of business is noticeable in one or two directions. Generally speaking, however, prices have a downward tendency, due to the increased production consequent upon the opening-up of the coke-ovens. The engineering lock-out is a disturbing influence for the time being; but it has no direct connection with the coal tar products market. Pitch maintains its strength without much change in prices. Solvent naphtha is quiet, with quotations between 2s. 6d. and 2s. 8d. per gallon. Refined naphthalene is dull at £17 per ton, and crude at £5 per ton; the demand for the latter quality not being very great, and the firelighter manufacturers taking the cheapest quality obtainable. Carbolic acid remains without any change, though there seems to be a little inquiry for crystals at 5½d. per lb. Cresylic acid is steady at 2s. 4d. per gallon for best 97/99 p.ct. quality. Benzole is quiet and somewhat easier; 90's being 2s. 2d. per gallon, and pure 2s. 11d. Creosote is much more plentiful at 4½d. to 5d per gallon according to position. In intermediate products, there is nothing startling since our last report. A fair number of small orders are coming to hand, and a little export trade is passing. There is no change in quotations.

Sulphate of Ammonia.

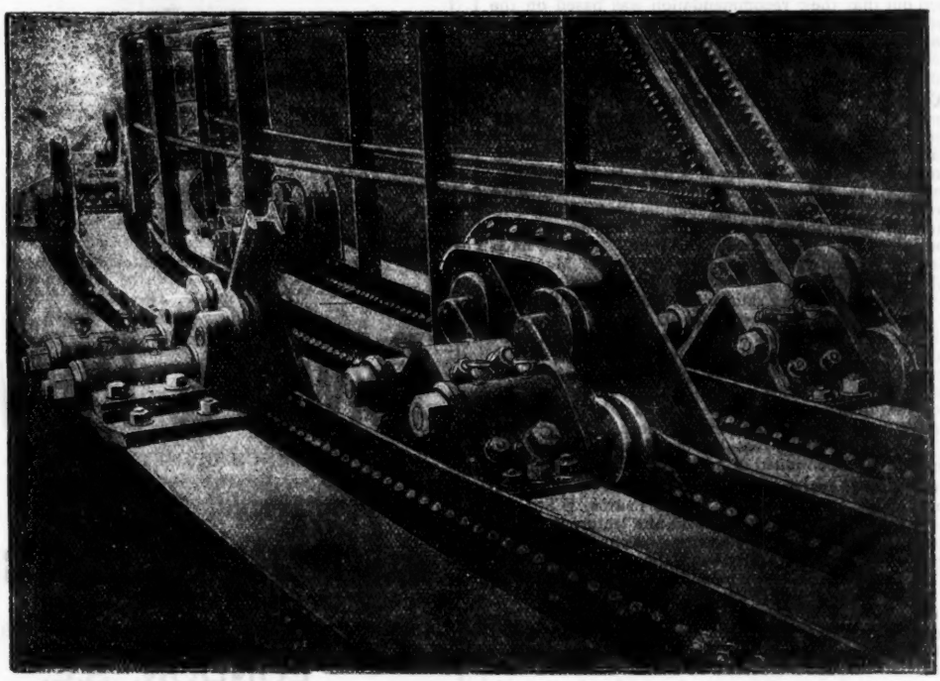
Conditions in sulphate of ammonia remain just about as they were; the entire output going into consumption as fast as it is produced. Many manufacturers have sold their output to the end of May; and (as before pointed out) consumers who have delayed placing their orders stand a good chance of going without unless imports of this material are made. At the same time, there is a very considerable export inquiry, and some moderate parcels are going out to particular destinations.

The price of gas at Montrose has been reduced 5d. per 1000 c.ft.

The Birmingham Gas Department have installed shilling-in-the-slot meters in Corporation houses, and in houses in outlying areas, in order to economize in collection. They are proving very successful. The penny-in-the-slot meters number nearly 100,000.

At a meeting of the St. Anne's Ratepayers' Association, on the 15th inst., Mr. C. W. Knowles said that nothing done by the local Council had caused so much ill-feeling as the purchase of the gas-works for £69,000. The public ought to be taken more into the confidence of the Council. Mr. J. Kershaw pointed out that the purchase was brought about by the proposed amalgamation of towns. In the event of Lytham and St. Anne's joining, they would, had the purchase not been carried through, have been in the position of having one part supplied from public gas-works and the other by a private company, at different rates.

The third annual gathering of the employees of the Belgrave Gate Gas-Works, Leicester, took place last week, when a very enjoyable time was spent. The Gas Engineer (Mr. Hubert Pooley) presided, and was supported by Mr. William Smith (Superintendent of Works) as Vice-Chairman. Mr. S. Lovell (Assistant Manager), and Mr. William Pingriff (Chief Meter-Inspector). Mr. Pooley, in expressing his appreciation of the privilege of meeting so many of his men, referred to the great pride he had in their efforts to maintain the spirit of brotherliness and goodwill. He then gave interesting details of the growth of the output of gas from the "old" works, which had just passed their century, and explained to the men how, notwithstanding the increase of business, the financial result of the past year's working showed a deficit. A hearty vote of thanks was accorded Mr. Pooley for his presence.



THE NEW "BEARSCOT" TWIN GUIDE ROLLERS

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MANCHESTER.

Double Gas Fatality at Kilmarnock.—It was discovered at Kilmarnock last Friday that a Mrs. Deane and her daughter had been poisoned by gas at their house, as a result of an escape from a defective pipe near the meter. The woman, who lived alone, had evidently died in her sleep.

Larger Gas Sales at Horley.—As compared with the corresponding period of 1920, the sales of gas by the Horley District Gas Company in the final half of last year showed the substantial increase of 10·29 p.ct. There was an available balance on profit and loss account of £2028; and the Directors recommended the payment of dividends at the rate of 5 p.ct. per annum on the "A" capital stock and 3½ p.ct. per annum on the "B" capital stock—both less income-tax. The payment of these leaves a balance to be carried forward of £790.

Woking District Gas Company.—A dividend at the rate of 5 p.ct. per annum on the "A" and "B" ordinary stocks for the past half year was declared at the recent meeting of the Company; this payment leaving a balance of £1469 to be carried forward. Receipts from the sale of gas showed an increase of 12·47 p.ct. over the corresponding period of 1920, and residual products a decrease of 9·63 p.ct. The Company have secured an Order substituting a standard price of 18·2d. per therm for the 4s. 6d. per 1000 c.ft. originally authorized under their Act of 1912.

Finances at Salford.—A statement was received by the Salford Town Council at their last meeting from Alderman Phillips, the Chairman of the Gas Committee. He said that, though the Committee would finish the year with a considerable deficit, yet in view of the reductions in the price of coal and some remissions in the cost of wages and certain materials, and having regard to the slackness of industry and commerce and the great amount of unemployment, the Committee had appointed himself, the Deputy-Chairman, and the Engineer (Mr. W. W. Woodward) to examine the figures, and to bring forward for consideration the question of reducing the price of gas. This would be done as early as possible.

Gas Company's Shares in Oil Wells.—As evidenced by the report and balance-sheet of the Electricité et Gaz du Nord Company, says the "Petroleum Times," the position of things is even better than before the war. The Company have several other companies under their control; but it transpires also that this Company own 40 p.ct. of the shares in the Société d'Etudes et de Recherches Pétrolifères and the Société de Recherches d'Hydrocarbures. The gas which has been struck at Bugey, in the Ain, giving out 100,000 cub m. a day, was found by the first named of these two exploring Companies; and the Directors of the Electricité et Gaz du Nord are apparently very pleased about it. But in their ordinary working also the Company appear to have had a very successful year.

Gas Price Discussed at Ossett.—Vigorous debate arose in the Ossett Town Council last week, on the Gas Committee's proposition to reduce the price of gas by 1s. per 1000 c.ft.—from 5s. to 4s. There was considerable opposition, on the plea that a debit balance was likely at the end of the current year; and an amendment was moved that the question be deferred for three months. A further amendment was that the reduction should be only 6d. per 1000 c.ft. All parties came well armed with masses of statistics and gas-works figures. The Committee pointed out that their recommendation was based on the advice of the Gas Manager (Mr. A. E. Mottram); and they asked who was likely to know the situation better than he? The aim, of course, was for bigger consumption. The recommendation was eventually carried by a substantial majority.

Dover Gas Company's Report.—The accounts for the past year showed a gross profit on the working of £3448, which, in the circumstances, the Directors deemed satisfactory. Out of this, the sum of £600 had been carried to reserve account; and the Directors recommended a dividend for the year at the rate of 5 p.ct., less income-tax. But for the miners' strike, the result would have been even more satisfactory. The Directors, after serious consideration, decided to put the manufacturing, distribution, and accountancy departments of the Company's business under the control of one head; and they have appointed Mr. George W. Anderson Engineer and General Manager, with charge of all the departments. They have every reason to hope that their action will result in a very satisfactory improvement in the business. It is expected that the new plant in course of erection at the works will be in operation in a few weeks; and the Directors are advised that this should result in a material reduction in the cost of manufacture. The Directors were pleased to be able to announce a reduction of 1s. per 1000 c.ft. in the price of gas for the latter half of the current quarter. To the great regret of his colleagues on the Board, Mr. Willsher Mannering, who had been a Director of the Company for 48 years, and for 35 years had occupied the position of Chairman, was compelled by continued ill-health to resign his office.

Gas or Electricity for Industrial Purposes.—At a meeting of the Sheffield Gas Consumers' Association, Mr. G. G. Pearce, B.Sc., of the Metropolitan-Vickers Company, in the course of a lecture, said the only disadvantage ever brought against electricity was its initial cost. Still, the power cost of our principal electricity stations—such as Newcastle, Sheffield, and Manchester—compared very favourably with those charged at the best and largest hydro-electric stations in Europe or America. In the gas industry, they found a different state of affairs. The capital cost of plant represented a much smaller proportion of the finished product than in the electrical industry; and consequently gas had been more badly hit through increases in labour costs and material costs. It was not easy to give comparative figures for the cost of running gas-fired and electrical furnaces; but the best argument for electricity was the enormous growth of the number of furnaces installed. Mr. David Flather, presiding, said that one of the objects of the Gas Consumers' Association was to watch over the interests of gas consumers; and in pursuit of this object, they necessarily concentrated largely upon the efficiency or otherwise of the gas industry. One of the results of the war was that the gas was not of the quality to which they were accustomed in pre-war days, and for which the plants in their works were specifically designed. The reduction in quality had been followed by an advance in price; and, naturally, their thoughts turned in the direction of alternative methods of carrying out the processes involved in the making and treatment of Sheffield products.

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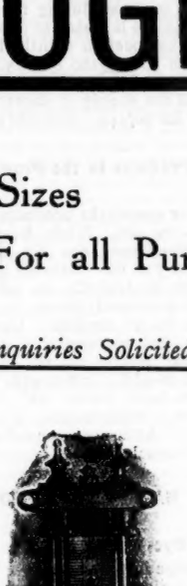

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STOCK MARKET REPORT.

THE Stock Exchange was quieter and duller last week, owing to the unsettled condition of public affairs. Government issues fluctuated irregularly, and Home Rails weakened.

Business in the Gas Market was on a reduced scale, but was full of interest. The movements in quotations were probably unprecedented in number. A large proportion of these were adjustments in respect of deduction of dividends; and in all cases the modifications were equivalent to a rise in price. Notable among them were Alliance and Dublin, Brighton, Bristol, Commercial, Hastings, Hornsey, Ilford, Lea Bridge, Portsea, Sheffield, Tynemouth, and Wandsworth. Other gainers (not *ex div.*) were South Metropolitan, South Shields, Southampton, and Tottenham. Imperial Continental was unchanged; but Primitivas were marked down, recent anticipations in regard to forthcoming events not yet being realized.

Bargains done for cash during the week were as follows: On Monday, British 28, Commercial 4 p.ct. 82, 82½, 82¼, Croydon "B" 152½, European 8½, Gas Light ordinary 79, 79⅛, 79½, 79¼, 79⅜, 79⅝, 80, ditto maximum 57, 57½, 57¼, 57⅜, 60, 60¼, ditto preference 71½, 73, Imperial Continental 148½, 149, 149¼, 149½, 150, ditto debenture 69. Primitiva 21s. 3d., 22s., 22s 6d., ditto preference 58s, 59s., 59s. 6d., 60s., 60s. 6d., River Plate debenture 55s., South Metropolitan 83, 83¼, 84, 84½, ditto debenture 55, 56, South Suburban 90, 91, Tottenham "B" 82½, Liverpool 7 p.ct. preference 104, 105, ditto £30 paid 34, 34½. On Tuesday, Alliance and Dublin 62½, 63, Commercial 4 p.ct. 81½, 82, 82½, Croydon "A" 190, 192, ditto "B" 151½, Gas Light ordinary 79, 79¼, 79⅛, 79⅜, ditto maximum 58⅜, 59, ditto preference 73, 74, ditto 10 p.ct. bonds 162, Imperial Continental 148, 148¼, Primitiva 20s., 21s., 21s. 3d., ditto preference 57s. 6d., 58s. 9d., 60s., ditto 1911 debenture 57, South Metropolitan 83⅛, ditto debenture 55, 56, 56½, Tottenham "B" 83½, 83⅜, British (Hull) 4 p.ct. debenture 70, 70⅜, Holyhead 4s., Liverpool 7 p.ct. preference 104⅜, ditto £30 paid 34, 34⅜, Richmond 5 p.ct. debenture 75½, South Suburban 7 p.ct. debenture 101½. On Wednesday, Alliance and Dublin 62½, Bombay 3 11/16, Brentford "A" 88⅜, ditto "B" 88, Commercial 4 p.ct. 82. 83. Continental Union 18, Gas Light ordinary 79, 79⅛, 79¼ 79⅜. 79⅝, ditto maximum 58⅜. 59. 59½, ditto preference 73, Imperial Continental 147, 148, 148½, 148⅜, 149, 149½, 149¼, Liverpool 76, Oriental 86, Primitiva 18s. 9d., 20s, ditto preference 56s. 3d., 57s. 6d., South Metropolitan 82, 83½, 84, 85, Southampton 62½, 63, Liverpool 7 p.ct. preference £30 paid 33¼, Richmond 5 p.ct. debenture 76½. On Thursday, Alliance and Dublin 63, Bombay 3⅞, Bristol 79, British 26, Commercial 4 p.ct, 82½, ditto debenture 55, European 8⅞, Gas Light ordinary 79, 79½, 79⅛, 79⅜, 79⅝, 80, ditto maximum 58½, 59, ditto 10 p.ct. bonds 162, Imperial Continental 147, 147½, 150, Malta and Mediterranean 43s. 9d., Monte Video 60, Oriental 85, 86, Primitiva 18s. 9d., 19s., ditto preference 55s., 56s. 3d., 57s. 6d., 58s. 9d., South Metropolitan 85, 85½, ditto 6½ p.ct. debenture 101, 101½, Liverpool 7 p.ct. preference 104, ditto £30 paid 33, 33⅜. Tynemouth 69. On Friday, Alliance and Dublin 62½, Commercial 4 p.ct. 80, Gas Light ordinary 78½, 78¼, 79, 79½, ditto maximum 58½, 59, Imperial Continental 147½, 148½, Primitiva 17s. 7½d., 18s. 9d., ditto preference 55s., 59s., ditto debenture 70, South Metropolitan 84, 85½, ditto 6½ p.ct. debenture 101½, South Suburban 90, Croydon 5 p.ct. "D" 67, ditto 7 p.ct. debenture 101, Liverpool 7 p.ct. preference 103⅞, ditto £30 paid 33-33⅞.

In the Money Market, there was a steady demand, but slightly easier before the close. The Bank rate is 4½ p.ct., as fixed on Feb. 16.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Shares.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mch. 15	4	4%	Aldershot 4 p.c. Pref.	...	50—55*	
1,551,861	,,	Oct. 13	2½	3⅛%	Alliance & Dublin Ord.	59—64	60—65	62½—63
374,000	,,	Jan. 12	4	4%	Do. 4 p.c. Deb.	76—79	46—51	..
280,000	5	Nov. 30	7½	4/-	Bombay, Ltd.	5½—6½	3½—4	3 11/16—3⅞
100,000	5	Feb. 23	16	7½%	Bournemouth Gas and Water { 5 p.c.	...	9—10	...
383,110	10	,,	7	7%	Bournemouth Gas and Water { B 7 p.c.	15—15½	8½—9	...
115,000	10	,,	6	6%	Bournemouth Gas and Water { Pref. 6 p.c.	13½—14	7½—8	...
162,063	—	Dec. 30	—	4%	Bournemouth Gas and Water { 4 p.c. Deb.	...	65—70	...
992,043	Stk.	Feb. 9	14	56/-	Brentford A Consolid.	261—266	84—89	88½
734,920	,,	,,	11	55/-	Do. B New	204—209	84—89	88
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	70—75	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	91—95	68—72	...
214,775	,,	Mch. 15	11	11½%	Brighton & Hove Orig.	208—213	140—145*	...
244,200	,,	,,	8	8½%	Do. A Ord. Stk.	154—159	100—105*	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	...	...	79
550,000	20	Mch. 15	12½	10%	British	44—45	26—28*	28
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk	88—90	68—72	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	52—57	...
100,000	10	May 27	—	6%	Cape Town & Dis., Ltd.	1½—2½	6—7	...
100,000	10	Oct. 28	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5½	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	58—61	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	Mch. 15	5/9/4	42/8	Commercial 4 p.c. Stk	106—108	78—83*	80—83
560,000	,,	,,	5½	38/4	Do. 3½ p.c. do	103—105	78—83*	...
475,000	,,	—	5	5%	Do. 3 p.c. Deb. Stk	69½—71½	53—58	55
800,000	,,	Dec. 15	4	—	Continental Union Ltd	78—79	18—20	18
200,000	,,	,,	7	—	Do. 7 p.c. Pref	113—118	33—38	...
31,600	,,	Feb. 23	15	15%	Croydon A 10 p.c.	...	185—195	190—192
278,400	,,	,,	12	12%	Croydon B and C 7 p.c	...	145—155	151½—152½
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 26	10	5/0	European, Ltd.	17½—18	8½—9½	8½—8⅝
6,298,975	Stk.	Feb. 23	4/17/4	46/8	Gas Light { 4 p.c. Ord.	98—102	78—80	78½—80
2,600,000	,,	,,	5½	55/-	Gas Light { 5½ p.c. max.	76—79	57—60	58½—61½
4,062,235	,,	,,	4	4%	Gas Light and Coke { 4 p.c. Con. Pref	96—99	70—75	71½—74
4,674,850	,,	Dec. 15	5	5%	Gas Light and Coke { 5 p.c. Con. Deb	72½—74½	53—58	...
150,000	,,	Dec. 11	10	10%	Gas Light and Coke { 10 p.c. Bonds.	...	...	169
82,500	,,	Sept. 14	5	5½%	Hastings & St. L. 5 p.c	...	...	...
258,740	,,	Mch. 15	3½	2½%	Do. 3½ p.c	87—89	45—55*	...
70,000	10	May 12	11	5½%	Hongkong & China, Ltd	16½—16¾	5¼—6¾	...
86,600	Stk.	Mch. 15	9	9%	Hornsey 7 p.c.	...	100—105*	...
131,000	,,	,,	7½	7½%	Ilford A and C	151—154	110—120*	...
65,780	,,	,,	6½	5½%	Do. B	115—118	96—101*	...
63,500	,,	Dec. 30	4	4%	Do. 4 p.c. Deb.	92—94	60—65	...
1,976,000	,,	Oct. 28	9	5%	Imperial Continental	150—160	147—152	147—150
1,235,000	,,	Feb. 9	3½	3½%	Do. 5½ p.c. Deb. Red	14—86	67—72	69
233,174	,,	Mch. 15	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	75—80*	...
2,498,903	,,	Feb. 26	10	57/6	Liverpool 5 p.c. Ord. { A	213—215	...	76
					Liverpool 5 p.c. Ord. { B	146—148	...	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk	...	...	...
165,736	,,	Feb. 23	7/3/0	6%	Maidstone 5 p.c.	...	53—55	...
63,480	,,	Dec. 30	—	5%	Do. 3 p.c. Deb.	...	43—46	...
75,000	5	June 11	6	5%	Malta & Mediterranean	4½—4¾	2—2½	43/9
250,000	100	Oct. 3	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	93—100	...
341,920	Stk.	Nov. 30	4	4%	Monte Video, Ltd.	11½—12	57—62	60
1,875,892	,,	Feb. 23	4½	4½%	Newcastle & Gateh'd Con.	98½—99½	72—73	...
529,705	,,	Dec. 30	3½	3½%	Do. 3½ p.c. Deb.	82—83	61—65½	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	...	12½—13	...
55,940	10	Mch. 15	7/14/0	10/12	,, ,, 7 p.c.	14—15	8½—9½*	...
500,000	Stk.	Dec. 15	8	8%	Oriental, Ltd.	117—122	84—87	85—86
60,000	5	—	10	—	Ottoman, Ltd.	7½—7¾	2—3	...
188,120	Stk.	Dec. 30	—	6%	Plym'th & Stonch'se 5 p.c.	...	69—71	...
60,000	50	Mch. 15	13	62/6	Portsea Island, B	128—131	87—90*	...
100,000	50	,,	12	57/6	Do. C	118—121	80—83*	...
249,980	5	—	8	-	Primitiva Ord.	5½—6	1/16—1/8	17/7½—22/6
499,960	5	—	8	—	Do. 5 p.c. Pref.	4½—5	2½—3	55/—60/6
521,600	100	Dec. 1	4	4%	Do. 4 p.c. Deb.	91—93	70—75	70
600,000	Stk.	Jan. 26	4	4%	Do. ,, ,, 1911	...	52—57	57
346,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85—87	52—57	55
150,000	10	Sept. 29	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	6—6½	...
125,000	50	Jan. 3	5	5%	San Paulo { 5 p.c. Deb.	47—49	36—39	...
135,000	Stk.	Mch. 15	10	5%	Sheffield A	223—224	73—73*	...
209,984	,,	,,	10	5%	Do. B	222—224	73—75*	...
523,500	,,	,,	10	5%	Do. C	220—222	73—75*	...
133,202	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	Oct. 28	9	8%	South African	10½—17½	7—9	...
2,609,893	Stk.	Feb. 9	5/4/0	5%	South Met. Ord.	111—113	84—86	82—85½
250,000	,,	Jan. 12	—	5%	Do. Red. Pref.	...	94—96	...
1,893,445	,,	,,	5	5%	Do. 3 p.c. Deb.	72½—74½	53—58	55—56½
224,820	,,	Feb. 23	8½	8½%	South Shields Con. Stk	157—159	104—106	...
1,087,795	,,	,,	6	5½%	S'th Suburb'n Ord. 5 p.c.	114—116	87—92	90—91
368,837	,,	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	78—83	...
647,740	,,	Nov. 16	5	4%	Southampton Ord.	99—102	61—64	62½—63
121,275	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	...	60—62	...
120,000	,,	Feb 23	—	7½%	Tottenham { A 5 p.c.	135—138	88—93	...
782,275	,,	,,	6	5½%	Tottenham { B 3½ p.c.	115—117	80—85	82½—83½
181,255	,,	Dec. 15	4	4%	District { 4 p.c. Deb.	87—89	68—72	...
182,580	10	Dec. 30	3	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	
936,476	Stk.	Mch. 15	5	5½%	Tynemouth 5 p.c. max.	108½—109	68—70*	69
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Mch. 15	8½	66/3	Wandsworth A 5 p.c.	151—156	82—84*	...
255,636	,,	,,	6½	51/3	Do. B 3½ p.c.	129—134	66—69*	...
108,075	,,	,,	—	46/4½	Do. C	...	63—66*	...
140,865	,,	,,	—	46/4½	New Ordinary	...	63—66*	...
352,000	,,	,,	6½	45/-	Wimbledon 5 p.c.	117—122	63—66*	...
98,000	,,	,,	6½	50/-	Epsom 5 p.c.	121—126	63—66*	...
88,416	,,	Dec. 30	5	5%	5 p.c. Deb. Stk.	66—69	50—55	...

* Ex Div.

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